

THE SAFETY STORY OF THE ALL-NEW

2016 CHEVROLET MALIBU

AS TOLD BY THE PEOPLE WHO ENGINEERED IT.

We sat down with active safety expert Raymond Kiefer and engineering safety specialist MaryAnn Beebe to talk about the innovation that went into creating the available active safety technologies in the all-new 2016 Malibu.











RAYMOND KIEFER STAFF TECHNICAL FELLOW, ACTIVE SAFETY

What are some of the advanced active safety features engineered into the all-new 2016 Malibu?

Malibu offers a sophisticated range of radar, camera and ultrasonic crash-avoidance technologies to help drivers avoid crashes in everyday driving situations. In fact, we've engineered a number of available safety features, including Low Speed Front Automatic Braking, Lane Keep Assist with Lane Departure Warning and Rear Cross Traffic Alert. Before you make a lane change, the available Side Blind Zone Alert with Lane Change Alert feature lights up a side mirror icon if a vehicle is rapidly approaching or in your blind spot. Available Front Pedestrian Braking marks Chevrolet's first foray into helping drivers avoid pedestrians. An amber icon appears if a pedestrian is detected ahead and, if you're seconds away from a crash, red LED alerts flash on the windshield along with rapid beeping. If braking is delayed or if a pedestrian suddenly appears, the brakes are

automatically applied. This may not prevent the crash, but reducing crash impact speeds can make a real difference.

What's the difference between radar and camera technologies in active safety features?

Both technologies do an outstanding job of helping drivers increase awareness of what's going on around them. Radar is an active safety technology that improves vehicle detection range and works better in inclement weather conditions that may be a challenge for cameras. Camera technology works more like the way we see and avoid objects every day by using visual looming cues about the way objects grow in size as we approach. This technology is used in the available Low Speed Front Automatic Braking and available Front Pedestrian Braking features. Cameras can also show you hazards that you can't see directly with your eyes or mirrors.

Teen Driver is a tool for parents to continue to teach safe driving habits to their young drivers.

MaryAnn Beebe ENGINEERING SPECIALIST, TEEN DRIVER



MARYANN BEEBE ENGINEERING SPECIALIST, TEEN DRIVER

What is the Teen Driver¹ technology and how does it work?

Teen Driver is a tool for parents to continue to teach safe driving habits to their young drivers. It is a new feature that lets parents manage certain vehicle settings to encourage safer driving by their teenagers. Parents can set a volume limit for the radio and set a speed warning that will deliver an audible and visual warning when the vehicle exceeds the preset speed. When Teen Driver is active, the radio is muted if the driver or front passenger is not wearing a safety belt, and all equipped active safety systems are defaulted to "on." Our goal was to use technology to help teens develop safe habits and, ultimately, be safer on the road.

How does the in-vehicle report feature work with other active safety features?

The Teen Driver in-vehicle report feature provides a snapshot of a teen's driving behavior. A parent can enter their Teen Driver PIN, and the report shows distance driven, maximum speed, number of over-speed warnings and how many times certain active safety features were engaged. For example, if the vehicle is equipped with available Forward Collision Alert or available Front Automatic Braking, the in-vehicle report will show how often these safety features were triggered. The in-vehicle report empowers teen drivers to show they've been driving responsibly, or see what driving skills they need to work on, and parents can continue to coach their new drivers. As a mom myself, it's rewarding to know that we're helping make a tangible difference. We want to set the industry standard for safety.



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Behold the All-New motortrend.con

Since you've opted for the analog version of Motor Trend, you might not be a regular visitor to motortrend.com. If you haven't been in a while, please grab your favorite Web-enabled device and take us for a spin. You should notice immediately that the site looks very different thanks to a top-down overhaul of its design and functionality.

The sheet met-er, pixels are totally new and sculpted with familiar cues lifted from these pages. We updated the font package (to include Oswald and Open Sans, if you're a design head) for a more contemporary look and better legibility. And because we

know a huge reason people come to motortrend.com is for our award-winning pictures, we made our photos bigger, better, and quicker to load with a clever new gallery format.

Same goes for all the slick video we're famous for; we redesigned where and how you view videos on the site with the help of the same company that supports our new on-demand video channel (motortrendondemand.com).

Speed was another target for improvement, so we made significant upgrades under the hood, as well. We jettisoned the proprietary software that was the foundation of motortrend.com from the beginning and brought on the open-source horsepower and flexibility of the WordPress platform. We even switched to a new server company, one better suited to handle the speed and growth we are after.

It's not just speed we're targeting but efficiency, too, so we took a long, hard look at how visitors use the site and then redesigned the entire experience to decrease load times and redundant clicks. Our homepage features new dynamic, modular templates that prioritize what you need to know right now. During a major auto show, the homepage switches to a multiwindow format best suited for the constant flow of new car debuts. For a signature feature such as our Best Driver's Car competition, we have a special in-your-face layout that spreads the action across your screen.

And that's no matter what device you choose, as we've optimized our new site for mobile. The

> new motortrend.com is fast, flexible, and dynamic; no matter how you browse. Be it from your Dell desktop, Samsung Galaxy tablet, or iPhone 6, the experience will be the best it possibly can be.

If you're shopping for a new ride, you'll find our car-buying tools have also been vastly improved. We've

cut away underperforming pages, condensed the good stuff, and added more than 130 new vehicle write-ups in a format that keeps the most current and useful information at the top of the page. We also streamlined the navigation. Wherever you are on the site, should the mood to shop strike you, our new marketplace is only a click away.

Same goes for the latest fuel economy information. Our industry-exclusive Real MPG calculator now has its own tab in our main navigation bar. It gives you direct access to realworld fuel economy data on hundreds of cars, trucks, and SUVs.

Whew, sounds purty slick, right? But perhaps you're a bit suspicious, because unlike all the new cars, trucks, and SUVs we review in these pages, we definitely have a proud and vested interest in our website. Well, don't just take my word for it-please check out motortrend.com, kick the tires, and take it for a spin. I know you're going love it. ■

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FIRST LOOK

New Volvo S90 Revealed

Hot on the heels of the long-awaited XC90 crossover becoming our 2016 SUV of the Year, Volvo has revealed the equally longawaited replacement for its S80 flagship sedan, now dubbed S90.

Built on Volvo's new Scalable Product Architecture (SPA), which also underpins the XC90, the new 2017 S90's design is heavily influenced by Volvo's Concept Coupe.

The base S90 T5's 2.0-liter,



turbocharged I-4 will make "around 250 hp," according to Volvo U.S. president Lex Kerssemakers. That's about what the turbo-four is good for in the smaller S60 T5 Drive-E. The S90 T6 and S90 T8 powertrains will mimic those in the related XC90, meaning T6 buyers can expect the supercharged and turbocharged, 2.0-liter I-4 to make

316 hp and 295 lb-ft of torque, and the hybrid T8 will make 400 hp and 472 lb-ft of torque and offer about 30 miles of EV range. All S90s are available in frontand all-wheel drive, with the exception of the S90 T8, which is all-wheel drive only. An eight-speed automatic is standard across the board. The T6 will likely bethe volume

engine. Thanks to the VW scandal, diesel engines are off the table for the U.S. market.

When the first 2017 Volvo S90 arrives in the U.S. in June or July, it'll be priced slightly higher than the S80 it replaces (\$44,390 to start) but lower than the XC90 (\$50,795 to start), which serves as a flagship for the company. Volvo is launching the S90 in T6 and T8 forms with the midlevel Momentum and loaded Inscription trims. The S90 Kinetic base model will join the lineup along with the T5 engine in the second year of production. For the first model year, all U.S.-spec S90s will have the optional rear air suspension instead of the standard transverse rear leaf spring.



LOOKOUT Unlike its competitors' systems, Volvo's collision mitigation can identify some large animals in addition to people and cars.





I can't afford to have a car fail."

THEY SAY P32 INTERVIEW DON SWEARINGEN, EVP, MITSUBISHI

An updated version of Volvo's Pilot Assist semi-autonomous tech will be standard on S90s here in the States. Unlike the older version of Pilot Assist currently found on the XC90, the newer version can function at speeds up to 80 mph as opposed to 30 mph, and it no longer needs a car in front to follow, as it will read lane markers on the road. XC90 buyers who feel like they're missing out on the semi-self-driving goodness will be able to upgrade their vehicles at a later date.

With the United States and China expected to be the S90's largest markets, we can expect a long-wheelbase variant of the new Volvo sedan in the near future. The S90L, as it'll likely be called, will be the biggest a Volvo will get. The company has no plans to build an S-Class rival. The S90's main rival, for what it's

YOUR SAY P34
READERS TALK BACK



worth, is the Audi A6.

Although Kerssemakers says he won't exclude it, he doesn't feel the S90 is the right car to get the Polestar treatment in the U.S. An upcoming S90 R-Design is likely the sportiest variant of the new Volvo sedan we'll get. There is something to get excited about: wagons. The Volvo V90, which has yet to be revealed, is all but guaranteed for the U.S. The Volvo V90 will be shown in March, likely at the New York show.

The V90 will also spawn a

lifted version by the end of 2016, dubbed the V90 Cross Country. Officially there's no confirmation from Volvo HQ that the V90 will come to the U.S., but Kerssemakers said that he has every intention of bringing both to America. **Christian Seabaugh**



The 2017 \$90's design is heavily influenced by Volvo's Concept Coupe.



When you combine the sporty aspects of a coupe and the versatility of an SUV, you get a crossover that feels at home everywhere. The Infiniti QX50's 325-horsepower V6 engine provides 267 lb-ft of torque, giving you the power you want at a moment's notice.



Intake

Volkswagen Scandal Worsens as V-6 Diesel Engines Are Implicated

Volkswagen's situation has taken another turn for the worse as the company has admitted its 3.0-liter TDI V-6 engine also employs an emissions cheating device. The admission came 18 days after Volkswagen issued an explicit denial of EPA allegations that the V-6 diesels are also cheating on emissions.

The admission adds another 85,000 vehicles to the total, a number 8.5 times larger than the EPA had alleged. The original complaint fingered 10,000 vehicles from the 2014 and 2015 model years, as well as an unknown number of 2016 models. Volkswagen admitted 75,000 additional vehicles from the 2009 to 2013 model years also employed cheat software.

In response to the initial allegation, Volkswagen put a stop-sale on all affected new and used Audi, Porsche, and Volkswagen cars and SUVs. The stop-sale has been extended to include every diesel V-6 vehicle since 2009. These include the Audi A6, A7, A8, Q5, and Q7; the Porsche Cayenne; and the Volkswagen Touareg.

According to the Notice of Violation of the Clean Air Act issued by the EPA, vehicles equipped with the 3.0-liter TDI V-6 engine emit up to nine times the nitrogen oxide allowed by law.

Volkswagen initially denied the allegations.



"Volkswagen AG wishes to emphasize that no software has been installed in the 3.0-liter V-6 diesel power units to alter emissions. ..."

"Volkswagen AG wishes to emphasize that no software has been installed in the 3-liter V6 diesel power units to alter emissions characteristics in a forbidden manner," the automaker said in a statement.

Following the admission, Audi officials clarified to Automotive News that the vehicles contained "auxiliary emissions control software" that is legal in Europe but was not disclosed to U.S. regulators. As with the fourcylinder engine, the software detects an emissions test in progress and enables "temperature conditioning" mode, which turns on the emissions system. In normal driving, the emissions system is deactivated. Audi officials told Reuters the fix would likely be a relatively inexpensive software update. At press time, a fix had been proposed to regulators but not publicly announced.

A fix for the cheating four-cylinder diesel models had been submitted to California's Air Resources Board for review, but details had not been announced publicly at press time.

The newly revealed cheating could add up to \$3.2 billion in additional fines to the potential \$18 billion in fines Volkswagen is already facing in the U.S.

The scandal has also claimed the career of Ulrich Hackenberg, the Audi board member responsible for technical development and

> the driving force behind Volkswagen Group's modular vehicle platforms, which underpin nearly all of the group's new vehicles. Hackenberg was also behind the group's push toward electrification. He officially retired in December after reportedly being suspended in September. Nine total executives have been suspended so far.

The company notes that the cars don't pose a safety risk for drivers.

Volkswagen has set aside an additional 2 billion euros to fix the problem and is in contact with regulatory agencies discussing solutions to the problem.

Newly minted Volkswagen chairman Hans Dieter Poetsch, speaking at a press confer-

ence, cited three causes for the diesel scandal: a tolerance

for breaking the rules in some parts of the company, individual failures, and flawed processes.

Scott Evans



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Hyundai Relaunches Genesis as Independent Brand



line into a standalone global luxury brand.

The company is targeting "new luxury, echo-boomer" customers with six new Genesis vehicles globally by 2020. Hyundai spokespeople confirmed all six vehicles will be available in the U.S. by 2021.

Hyundai is aiming at traditional European luxury brands with Genesis and plans to build all of its vehicles on rear-wheeldrive platforms. The latter is a distinct departure from the approach taken by current Japanese and U.S. luxury brands. The Genesis brand will also have its own unique design language, a distinct winged emblem based on the current Genesis logo, and a separate naming convention to differentiate it from Hyundai.

Genesis vehicles will have an alphanumeric naming convention based on the letter "G" followed by a two-digit numeral. Hyundai revealed that the first three vehicles will be the G90, G80, and G70,

The G90 will be the current Hyundai Equus flagship replacement (dubbed EQ900 in Korea) and is due this year as a 2017 model-year vehicle. The current Genesis sedan will be renamed G80 for the 2017 model year and will be followed by the G70, an entry-level luxury sports sedan.

Names of the other vehicles were not released but include a midsize luxury SUV based on the G80 and a smaller near-luxury CUV based on the G70.

Rounding out the sextet will be a G80-based sports coupe, essentially the next-generation Genesis coupe. Hyundai representatives confirmed that the Genesis Coupe will be dropped from the



Hyundai line as it goes upmarket in the Genesis brand.

Details on how Genesis vehicles will be marketed, sold, and serviced were sparse. Hyundai officials demurred when asked whether Genesis vehicles would be sold alongside Hyundai vehicles in existing Hyundai stores or in standalone Genesis

dealerships. Reps did confirm the 2017 G90 flagship will be available through the 400 Hyundai dealers that agreed to a special covenant that allows them to sell the current Equus.

To help establish the Genesis brand's new design identity, Hyundai Motor Group president and chief design officer Peter Schreyer announced the hiring of Luc Donckerwolke, former head of design at Bentley and Lamborghini. Though he will not officially start until mid-2016, Donckerwolke has been tasked with styling the Genesis brand within Hyundai's newly created Prestige Design Division and has been named head of the Hyundai Motor Design Center.

Edward Loh



NHTSA Proposes Changes to Rating System

The U.S. Department of Transportation has announced proposed changes for the National Highway Traffic Safety Administration's 5-Star Safety Ratings. Among the revisions are new tests that evaluate advanced safety tech and pedestrian protection, as well as more humanlike crash dummies that will provide more accurate data. A decision on whether to implement the changes will be made by the end of 2016.

Currently, the 5-Star Safety Ratings system, also called the New Car

Assessment Program, awards stars based on how well a vehicle protects occupants in three crash tests. The program also includes a checklist of recommended technology features, including rearview cameras and lane departure and forward collision warning systems. Under the new program, such advanced safety features would be evaluated and assigned a star rating that would contribute to a vehicle's overall

rating. Another proposed test would evaluate how well a car protects a pedestrian from head, leg, and pelvic injuries.

The Insurance Institute for Highway Safety (IIHS) introduced the small overlap front crash test to its evaluations in 2012, and the NHTSA wants to add a test that evaluates performance in another type of collision that, according to NHTSA documents, "continues to result in deaths and serious injuries despite the use of seat belts, air bags, and the crashworthy structures of late-model vehicles." That deadly accident type is

the frontal oblique crash, which involves a car hitting another object at an angle. Like the small overlap crash, the frontal oblique crash is dangerous because the energy isn't distributed evenly through a car's front crash structure, increasing the risk of deformation in the cabin

NHTSA also wants to improve its full frontal barrier crash test to better consider rear seat occupants. To collect more accurate data, NHTSA wants better dummies. The updated dummies include the Test device for

> Human Occupant Restraint (THOR), which delivers more data on restraint systems, and WorldSID, a dummy specifically developed for side impact tests.

"NHTSA's 5-Star Safety Ratings have set the bar on safety since it began in 1978, and today we are raising that bar," U.S. Transportation Secretary Anthony Foxx said in a release. "The changes provide more and better information to new-vehicle shoppers

that will help accelerate the technology innovations that saves lives."

In addition to the changes, the Department of Transportation also wants NHTSA to have the ability to update its testing procedures more quickly to keep up with new safety technologies. Under the new system, half-stars would be issued for the first time to more precisely portray vehicle safety performance.

The new system is expected to be in place by model year 2019. You can view the full proposal at safercar.gov. Alex Nishimoto



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McLaren 675LT Spider Debuts

larity of the McLaren 675LT, the sports car maker is introducing a new model in the 675LT range: the drop-top 675LT Spider. The car is virtually identical to the coupe save for a three-piece retractable roof and unique color and wheel options. Like the coupe, the McLaren 675LT Spider is limited to just 500 copies.

The 675LT Spider uses a revised version of McLaren's twin-turbo, 3.8-liter V-8 to produce the same devilish 666 hp and 516 lb-ft of torque as the coupe. That engine makes the extra power thanks to new, more efficient turbochargers, revised cylinder heads and exhaust manifolds, lightweight connecting rods, a new camshaft, and a high-flow fuel system, among other upgrades. The traction-control system limits torque to 443 lb-ft in first gear to minimize wheel slip and improve acceleration. The result is a McLaren-estimated 0-62 time of 2.9 seconds, just 0.2 second slower than the coupe. The



claimed weight increase from the retractable top is 88 pounds.

Although it's heavier than its fixed-roof sibling, the 675LT Spider is still 220 pounds lighter than the 650S Spider. That's thanks to its generous use of carbon fiber, which can be found in the front bumper, side skirts, rear fenders, rear deck, diffuser, Longtail airbrake, and more. Of course The car uses the same carbon-fiber monocoque found in all non-P1 McLaren models.

The 675LT Spider has the option of an exclusive Solis exterior paint color (pictured) and

comes standard with 10-spoke, 19-inch forged alloy wheels wrapped in Pirelli P Zero Trofeo R tires developed specifically for the Longtail. Two other wheel options are available, including a new 20-spoke design and the five-spoke wheels that debuted on the coupe. The 35-pound airconditioning system has been removed but can be installed as a no-cost option.

The limited-production McLaren 675LT Spider arrives in the U.S. in summer 2016 and will be priced at \$372,600.

Alex Nishimoto

FAST Act to Fix Roads, Boost NHTSA

A \$300 billion highway bill signed in December by President Barack Obama will inject some muchneeded TLC into America's crumbling highway infrastructure. Other provisions in the bill will raise the National Highway Traffic Safety Administration's budget, triple the maximum manufacturer fine for safety violations, keep defective rental cars off the roads, and even give a boost to kit car manufacturers.

The five-year measure, called the Fixing America's Surface Transportation (FAST) Act, would be the first long-term highway plan in 10 years. Roughly \$300 billion will be spent on roads, bridges, and masstransit projects. The bill also raises NHTSA's budget for defect investigations from \$10 million a year to \$30 million, but only after the agency carries out the reforms recommended by the Transportation Department's inspector general in its extremely critical report of the NHTSA released last summer. NHTSA has vowed to make the changes by June.

Also included in the FAST Act's 1,300

pages is a provision for raising the maximum fine for safety violations to \$105 million, triple the current max of \$35 million. It also rewards employees who report potentially dangerous safety violations, and if the violation leads to a financial penalty for the automaker or supplier, the whistleblower could get up to 30 percent of the fines collected. Automakers will be required to keep safety data for 10 years, as opposed to five years currently, and need to provide part numbers for defective parts involved in a recall to NHTSA. Dealers are now required to inform customers of open recalls, and states will receive funds so they can notify owners who renew their vehicle registration that a recall is due. That

move is intended to better inform used car buyers, who have been difficult for automakers to track down in the past.

> In a win for kit car makers, they'll now be allowed to sell complete cars rather than kits, though their cars will still have to comply with federal emissions regulations.

Alex Nishimoto, Scott Evans

MIKE CONNOR

Although the Mercedes-AMG GTS was recently named our Best Driver's Car, the team from Affalterbach isn't resting on its laurels. A hotter version, called the AMG GT R, is in the works, and it's expected to be even more potent than the S. It's unknown whether Nissan will raise a stink about AMG using those three letters, but the AMG GT R will be the next high-performance variant of Mercedes' new sports car. Aside from gobs more power, massive rear tires, four-wheel steering, and active aerodynamics, look for the first-ever electronically adjustable Multimatic DSSV **shocks.** What it won't have: electric motors. We expect it to arrive toward the end of 2016...Been hearing whispers of a supercharged Viper? They're true, but it's not the car you think it is. Prepare yourself for the Viper ADR, Dodge's answer to the COPO Camaro and Ford Mustang CobraJet. ADR stands for American Drag Racing, and unlike the other two, it'll be street legal. Not only that, but it'll also be a 9-second car. Our sources say it'll pump out a Hellcat-shaming 900 hp and 800 lb-ft. Putting the power down will be the first-ever automatic transmission in a Viper, a heavy-duty unit designed purely for drag racing...On a less track-focused note, the new Bentley Bentayga will eventually get a V-6 model after the twin-turbo V-8 and hybrid models hit the market. It will likely use the Audi S4's 350-hp/369lb-ft turbo unit. A diesel was under consideration until parent company Volkswagen screwed that up, but it could still turn up in Europe. Also on the docket: a fastback 'coupe" model to cash in on the popularity of the BMW X6 and Mercedes-Benz GLE Coupe. May the car gods forgive them all.



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Intake





2017 Mercedes-Benz GLS-Class

"There is nothing more you could want or need in an SUV," our former road test editor Scott Mortara said about the outgoing Mercedes-Benz GL when it won our 2013 Sport/Utility of the Year award. But is there room for improvement?

The renamed 2017 Mercedes-Benz GLS receives a retuned air suspension, a new nine-speed automatic, an 8-inch COMAND screen, and a redesigned interior. The midrange GLS550—other models include the GLS350d, GLS450, and range-topping AMG GLS63—has 449 hp, 20 more hp than its predecessor. Drivers can select up to six modes, including Comfort, Slippery, Sport, Individual, Off-Road, and Off-Road + for further customization.

Other than these changes, the GLS is a conservative update. Sure, you'll find vestiges of the GL, including the numerical pad and the hodgepodge of buttons cluttering the center console. But with the GL already leading the competition in U.S. sales, perhaps Mercedes didn't need to make any huge changes. More buyers in our market choose the GL than the Infiniti QX80, Audi Q7, and even the standard wheelbase Cadillac Escalade.

To see if the GLS retains its former charms, Mercedes challenged us to drive the GLS500, the GLS550's Euro equivalent, in the Austrian



Alps. Slippery mode dulls throttle response on wet surfaces, reducing ESC intervention but making passing more difficult. Once you kick things up to Sport mode, the GLS immediately jumps into action to unleash a marvelous amount of power. In either driving mode, however, the GLS suffers from light, detached steering feel. It feels confident in snow. If you drive too exuberantly in Comfort mode in the white stuff, the electronic

nannies quickly come to the rescue while still allowing you to have a little fun.

Mercedes has long called its full-size utility offering "the S-Class among SUVs." We wouldn't object to the statement, but we'd add to it. Not only does it have a quiet cabin and highly composed ride, but it has also further proven its cred off the beaten path.

Kelly Pleskot



SPECIFICATIONS 2017 Mercedes-Benz GLS550 Base Price \$94,000 (est) Vehicle Layout Front-engine, AWD, 7-pass, 4-door SUV Engine 4.7L/449-hp/516-lb-ft twin-turbo DOHC 32-valve V-8 Transmission 9-speed automatic Curb Weight 5,400 lb (est) Wheelbase 121.1 in L x W x H 202.0 X 76.1 X 72.8 in 0-60 MPH 5.0 sec (MT est) EPA City/Hwy/Comb Fuel Econ 14/19/16 mpg (est) Energy Cons, City/Hwy 241/177 kW-hrs/100 miles (est) CO2 Emissions, Comb 1.22 lb/mile (est) On Sale in U.S. Currently



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We Say...



Ron Kiino THE KIINOTE

Whale Tales Comparing Laguna laps in the 911 Turbo S and GT3 RS

At the 2014 Best Driver's Car competition, the 911 Turbo S put down a sizzling lap time of 1:35.62, making it the second-quickest

Porsche we've ever run at Mazda Raceway Laguna Seca, right after the ridiculous 887-horsepower 918 Spyder (1:29.89). Well, make that the third-quickest Porsche.

Four days post this past Thanksgiving on a chilly and cloudy day in Monterey, California, our pro racer Randy Pobst lapped an Ultraviolet GT3 RS around MRLS in just 1:33.29. That's 2.33 seconds quicker than the Turbo S. (Looks like the forecast should've been for purple rain.) Surprised? We were. Sure, the GT3 RS is the most track-focused 911 to date, but the Turbo S is no slouch, either. Moreover, the Turbo S is rated at 560 horsepower and 516 lb-ft (the new '17 gets bumped to 580 hp) and had all-wheel drive and optional Dunlop Sport Maxx Race rubber from the standard GT3. Should it have been more than 2.3 seconds slower than the 500-horsepower, 338-lb-ft rear-drive RS, which, granted, weighs about 400 pounds less but has the same carbon-ceramic brakes and slightly wider and possibly stickier Michelin Pilot Sport Cup 2 tires? To the data.

Approaching Turn 1, the more powerful Turbo S holds a slight lead, registering a top speed of 138.8 mph versus the RS' 137.9.

But as they enter the long, sweeping Turn 2, the RS closes the gap. At the first apex of the turn, the RS outgrips the Turbo S (1.25 g versus 1.20), creating an 8-foot advantage. But the Turbo S manages to carry more speed through the turn (minimum of 41.9 mph versus the GT3's 40.9) and catches the RS at the exit. That's the last time the Turbo S would ever be close.

Out of 2 and toward Turn 3, Pobst is able to accelerate earlier and harder in the RS, posting a speed of 95.3 mph, noticeably faster than the Turbo S' 91.7. By the midpoint between Turns 3 and 4, the RS is already 84 feet ahead. Coming into Turn 5, the RS has nearly doubled its lead-now to 150 feet-thanks to a better exit out of 4 and a speedier blast down the straight (125.7 mph versus 123.9). Around Turn 5, the RS once again outgrips the Turbo S (1.36 g versus 1.33), extending its lead another 10 feet by the midpoint to 6. From Turns 2 through 6, we see a similar dynamic, with the RS' data line resembling a V and the Turbo S' a U, showing that the RS exhibits very little mid-corner steady-state cruising compared to the Turbo S—just brake, turn, and go. "The RS is rather loose and requires immediate power to help stabilize the rear," Pobst says. "Braking and acceleration are separated. The Turbo S is better balanced and more comfortable to

lean on mid-corner, so it can blend braking and acceleration more."

A big lat-g advantage through Turn 6 (1.51 g versus 1.37) helps the RS launch out of the corner earlier and with more oomph. Despite heading uphill toward Turn 7, the comparatively torque-deficient naturally aspirated RS ups its lead to 212 feet over the Turbo S. Down the infamous Corkscrew, the RS stomps the Turbo S, testing director Kim Reynolds says when it posts a cornering speed more than 6 mph faster (50.7 versus 44.3). The stomping continues through Turns 9 and 10-each a high-speed, high-g endeavor-where the RS is able to accelerate sooner, corner harder, and just go faster. The stats for the last corner, the sharp left Turn 11, show the cars behaving similarly with negligible separation in lateral acceleration and cornering speeds, but the RS is so far ahead that it reaches the finish line some 350 feet and 2.33 seconds before the Turbo S.

"The RS is very track-oriented and feels it," Pobst says. "Light, quick, and responsive. The Turbo S is very capable on track, but it's more street-oriented—softer suspension, more body roll, a lot more mass—and feels like it. The speed difference comes from significantly greater agility of the RS, though the better-balanced AWD Turbo S was far easier to drive at the limit."





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We Say...



Frank Markus TECHNOLOGUE

ePaint Because flat, metallic, and pearlescent are for Luddites

I recently got to experience the new Bentley of SUVs-the Bentayga—a spectacular vehicle in terms of performance, panache, and price. Especially price. The prices charged are almost unfathomable for middle-class 50-percenters like me. Take only the paint, for example. There are seven "free" colors, but those are apparently so humdrum that of the 16 vehicles on hand for media drives, 15 sported hues from Bentley's "extended range," the prices for which run from \$5,715 to \$12,530. And this paint pretty much just sits there and shines—it doesn't even flop to four different colors like that Mystichrome stuff on a 2004 Mustang Cobra.

A few weeks earlier at the SEMA show, Chevy showed off the Krypton Camaro concept that featured LumiLor electroluminescent paint. Yes, paint that, in addition to coloring the car and shining, lights up. Now that's a paint job worthy of its five-figure price tag. Electroluminescent panels were patented by GE in 1938, and Sylvania helped EL instrument lighting make its automotive debut on 1960 model Chrysler products (Google "AstraDome dash"). The science involves radiative recombination, or spontaneous emission of light, wherein a phosphorescent material emits light photons when exposed to an electrical current. Various materials emit their photons at different color wavelengths-dope zinc sulfide with copper for greenish light, dope it with manganese for an orange-red color.

Darkside Scientific LLC's magic in developing LumiLor was figuring out a proper

insulating primer to allow the paint to be energized when applied on a metal surface and adapting a method of delivering the phosphorescent materials in an environmentally friendly, aqueous-based polymer solution that can be sprayed using standard high-volume, low-pressure paint spraying equipment. Nearly any illumination color can be achieved by starting with white, green, blue, blue-green, orange, or a few other custom phosphorescent source materials then top-coating them with a clear-coat tinted to subtract unwanted color frequencies. Current draw is minimal—illuminating roughly 5,000 square inches on the Krypton Camaro draws 64 watts at 16 volts. (An auxiliary battery with a boost converter, inverter and other electronics then produces 180-volt AC current.) Replicating this look on your Camaro would cost \$50,000.

If paint can convert electrons into light, can it also do the reverse? Well, not the same paint, but NanoFlex Power Corporation is

The Krypton Camaro concept's paint job is worthy of its five-figure price tag.

developing a solar photovoltaic paint that will. It ditches the more common inorganic silicon or gallium-arsenide photovoltaic chemistry for a new organic (carbon-based) semiconductor chemistry. This setup can be applied extremely thin and can be virtually clear for use even as a window film.

The concept involves two ultra-thin (vapor-deposited) organic layers sandwiched between a metallic cathode and an indium-tin-oxide anode. When photons from sunlight hit the top electron donor layer, they form excitons, a peculiar state where an electron and an electron hole are temporarily bound to one another. At the interface between this donor layer and an equally thin acceptor layer, the electron and the hole part company, and this release generates an electrical current. As with the LumiLor paint, an insulating primer must be used over metal parts. Production plans have yet to be announced, so it's unclear how the price will compare with the above glow paint or the merely super-glossy fivefigure Bentley Pearlescent Volcanic Black.

Don't expect to power your EV with its paint job, but a typical compact car coated in NanoFlex solar paint should be able to power its climate-control system and trickle-charge its battery pack on a sunny day. One thing's for sure—unless this solar paint costs a lot less than the Bentley or LumiLor stuff, I'd feel mighty guilty parking in the shade or in a garage.

ILLUMINATI All those bow ties light up in various shades from white to green thanks to Darkside Scientific's electroluminescent LumiLor paint, applied with standard sprayers over an insulating primer.



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BACKOF THE NAPKIN ED WELRURN, GM VICE PRESIDENT OF GLOBAL DESIG

Just after the Chevrolet Camaro and Colorado won our 2016 Car and Truck of the Year awards, we buttonholed and cajoled GM VP of Global Design Ed Welburn into a couple of quick sketches on the napkins we had specially made for the announcement party. We asked Welburn to encapsulate, in silver Sharpie, what the award meant to him and the Chevy team. He grimaced at the request but was a good—quick—sport about it.



3.16 TREND

From the Motor Trend Archive...





MARCH 1966 PRICE: \$0.50

Our March '66 issue was dedicated to racing. Our cover featured NASCAR, Indy, and Trans-Am

race cars, and we toured pits, garages, and racetracks with racing royalty Richard Petty, Ray Nichels, and Jim Hall. Craig Breedlove also told us about driving his Spirit II car 600 mph, and we drove the now-iconic Chevrolet Corvette 427.







MARCH 1986 PRICE: \$2.25

'Fast, Furious, Fun." That's our description of the Mazda RX-7, our Import Car of the Year. We also asked if another legendary Japanese sports car, the Toyota Supra, was finally a true sports car.

MARCH 2006 PRICE: \$3.99

The legendary Chevrolet Camaro is back! The concept for what would become the fifth-generation Camaro (and the star of the "Transformers" franchise) owned our March 2006 cover.



K-band false alarms driving you nuts?

The problem: Barraged by K-band false alarms lately? Seems like they're everywhere, and they hang on and on.

What changed? A new safety feature, the lane-change, or blind-spot, warning often uses K-band radar to "see" nearby cars.



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They Say



3.16 TREND

Mitsubishi sold 20,253 Mirages through November 2015.

Don Swearingen

EXECUTIVE VICE PRESIDENT, MITSUBISHI MOTORS NORTH AMERICA



Mitsubishi has gotten a lot of flak from enthusiasts in the past few years. The automaker made its name selling perfor-

mance cars and tough, rugged pickup trucks, but product lagged and sales fell. Two years of 20 percent sales increases have Mitsubishi back in the game, though. We asked executive VP Don Swearingen to tell us what happened.

You guys have had a surprising amount of success with the Mirage.

When we first launched, it was interesting because the true buff books just killed it because it wasn't the Evo. What we found is that a clear, simple message to our consumers—starting price of \$13,805, 44 mpg highway, and one of the best warranties in the industry—resonated with a lot of people. We fit into a niche that wasn't being filled.

Have you found the low-cost, valueoriented end of the market underserved?

Clearly it is in a segment that a lot of companies have left behind because a lot just can't give the features that these customers are looking for in a vehicle at that price range. We've been able to do it, and now we're adding Android Auto and Apple CarPlay.

Is the Mirage sedan still happening?

The Mirage sedan, we will [launch] in the U.S. in April at the New York auto show, and it will be for sale within a month or two afterward. It's going to be called the Mirage G4 in the U.S.

What does G4 stand for?

Damn good question. To be honest with you, they have all different names all over the world, like Attrage, and for us, building name awareness on that name would be very, very difficult. So in one market they call it the Mirage G4, and you know something? That just sticks with you a little easier.

Do affordable cars such as the Mirage signal where Mitsubishi is headed?

Well, we are more of a niche player. Clearly we have to be very strategic about what we bring to the U.S. I can't afford to have a car fail. We are spending our time doing more research about what consumers need and want in their car, and we're trying to deliver on that.



My goal is to do everything I can to get [a Mitsubishi pickup truck] to the U.S."

What are your dealers asking for next?

We're seeing the greatest success in CUV. When we decided to move most of our focus about three years ago to CUV, it was before the transition really happened. Number one markets were sedans. Now that the CUV has moved to the largest segment, I think the dealers are seeing that our company had the vision. And they're huge, growing segments here in the U.S.

Do you see Mitsubishi becoming a company that only builds crossovers in the future?

I see it more focused on CUV. We're talking

about our next CUV now. We're talking that we'll take the Outlander and move it a little up, and I mean up in size, so it will become a little wider, a little longer, and then we'll bring another car in between the Outlander Sport and the Outlander.

Is Mitsubishi in a position to compete in the overall marketplace, or will it stick only to segments it'll be able to compete strongly in?

What you're going to see out of Mitsubishi in the future is that we understand we only play in a few segments, but whatever segments we're going to play in, we're going to be there. We want to make sure we're giving customers what they need. I think most customers clearly are looking for reliable transportation with the features that make that ride comfortable and enjoyable for them, and they'd like to do it at a reasonable price, and our goal is to deliver that.

Are there holes in segments that you think you can fill?

Yeah, that's where that other CUV is coming in. Clearly we're going to look at a family of CUVs, and then of course hybrid technology. Plug-in hybrid is the drivetrain we're going with in other parts of the world, and in March we will be introducing the [production] Outlander in a plug-in hybrid.

Where does that leave the Lancer Evolution?

I think you'll see performance move more to CUV; I think you'll see a blend of combustion engine and electric. It's a new direction.

Mitsubishi is known globally for its pickups and vans, such as the L200 pickup and Delica van. Will any of these vehicles make their way to the U.S.?

A pickup truck is the one that's requested the most. With all the diesel issues going around, we're getting fewer requests for it, but clearly we would love to bring it in. We have an issue with the chicken tax here, and of course we don't have enough volume to have a plant here in the U.S. build it. [The U.S. is] starting to look at removing [the tax]. So once that happens, my goal is to do everything I can to get it to the U.S.

Christian Seabaugh





MCTORY ISSNEDE.

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READERS' THOUGHTS ON PAST ISSUES

You Again, Again

Enjoyed your Head 2 Head article in the December 2015 issue ("You Again"). Looking at the picture on page 42, it looks like the driver in the Ford Mustang weighs about 150 pounds more than the Chevrolet Camaro driver. If you would have switched drivers, there would have only been about a 2-pound difference in the weight. Wouldn't this have made a difference in the performance numbers?

LARRY VANEMELEN DOUGLASVILLE, GEORGIA

That's not very nice; our driver prefers being called husky. And no, swapping bodies would have made zero difference because the real test driver for both cars was the same. We promise we don't use photo staffers for ballast.—Ed.

I have tried hard but am still unable to find any 2016 Mustang GT anywhere near \$47,350. I have loaded every option I could find and still can't get past \$40K. My local dealer will sell me a loaded one for less than \$37,600. That's \$10 grand under your stated price. What gives?

JOHN SIOUSSAT CHINO VALLEY, ARIZONA

We may have different definitions of "loaded" because our \$47,350 GT Premium test car was LOADED: Triple Yellow paint with extra black roof; GT Performance package; Enhanced Security package; adaptive cruise control; navigation; and Recaro leather buckets—none of which factored into the decision.—Ed.

Poll Closed

Just got the latest issue (December 2015) and saw the "Technologue" article by Frank Markus about the new U.S. military SUV needing a nickname. If history is any indication (Jeep and Hummer), the guys are just going to simplify the existing abbreviation into a simple word, which will probably end up something like Jolly T. It just doesn't look very jolly to me, though. Looks like something the producers of the "Transformers" series would come up with. A hood and fenders from a 1970s GMC 6500, a cab from "Mad Max," and whatever else they needed to finish it off.

ANDREW J. BREZINSKI MADISON, ALABAMA

Jolt is a popular reader submission for Oshkosh's JLTV. So it's come down to this for the menacing new vehicle's nickname: Jolt or Jolly T?—Ed.

Agree to Agree?

I purchased your December 2015 issue of

LETTER OF THE MONTH

Gone, Not Forgotten

"The Arsenal of Democracy" (December 2015). A great insight, particularly for those not familiar with World War II and the enormous contribution the U.S. made to the war effort that still pales against the 405,000 or so U.S. combat and other deaths and more than 670,000 service personnel wounded.

One figure missing from the summary chart on page 88 was the Liberty and Victory Merchant Marine naval cargo ship program: 2,710 and 531 ships built, respectively. Developed and built to replace those transport ships lost to German U-boats and to ship the massive supply needs to Britain and the Soviet Union, 18 shipyards built the Liberty ships and six shipyards built the Victory ships.

RICHARD TAYLOR DALLAS, TEXAS

We're still in awe of the 41 billion rounds of ammunition produced.—Ed.



Motor Trend and was reading page 23 ("From Aston with Love: James Bond's DB10"). Your article says there were eight DB10s made for the new Bond movie, "Spectre." But the December issue of Automobile says there were 10 made. Now the question is, who is correct?

ALAN WILSON VIA THE INTERNET

We'll leave it to our Automobile buddies to defend their honor, but only eight DB10s were

fabbed up for making the movie. Two additional cars (to make 10) served as promotional prop pieces but didn't make an appearance on screen. So to answer the question ... we both are?—Ed.

Arsenal of Corrections

"The Arsenal of Democracy" (December 2015) is a fascinating read. However, the sidebar about the first nuclear weapons contains some inaccuracies. The bombs didn't contain uranium hexafluoride gas; they contained solid enriched uranium-235 and plutonium. Naturally occurring uranium-238 needed to be concentrated into bomb-grade material. This was done in building K-25 located in Oak Ridge, Tennessee. The 2 million-square-foot building contained the uranium hexafluoride (the corrosive gas) that traveled through pipes and plates with holes in them to increasingly enrich natural uranium by separating the isotopes. That process is known as gaseous diffusion. The bombs themselves were assembled in Los Alamos, New Mexico. As I understand it, additional nuclear material including plutonium was produced in reactors at the Hanford facility near Richland, Washington. Although I don't have specific information about the chrome tubing manufactured for the gaseous diffusion plant in Oak Ridge, it does make sense that they would have been asked to contribute their expertise in metal coating and manufacturing to help end the war. A vast number of scientists and engineers were recruited from many different industries to participate in the Manhattan Project at many sites around the country.

FRANK ORIENTERROCHESTER, NEW YORK

Your article "The Arsenal of Democracy" was very interesting, but it contained an error. Although the Willow Run plant did have a hard right, it was located entirely in Washtenaw County, not Wayne County. Legend has it that Ford wanted it entirely in Washtenaw to avoid paying the higher Wayne County taxes. I remembered reading this years ago in a biography of the Fords but could not find the book. However, Wikipedia validated my memory.

TOM REINEHRMANHATTAN BEACH, CALIFORNIA

It's a common misconception that many people and publications seem to get wrong. In your December 2015 article "The Arsenal of Democracy," you state that "the military selected the Willys-Overland MB



as its primary vehicle." The jeep was not designed by Willys but in fact was designed by the Bantam Motor Company in Butler, Pennsylvania. Bantam did not have the production capabilities for the U.S. government, and that is why Ford and Willys got the production contracts.

BERNARD CHRISTENSENBUTLER, PENNSYLVANIA

Upon receiving the December 2015 issue of *Motor Trend*, I was gratified to see the article "The Arsenal of Democracy" recounting the pivotal contribution of the United States automotive industry in the Allied victory in World War II. My passion for cars from early childhood led to my developing an equal passion for Second World War history, culminating in my majoring in history in college. It's great to see your magazine telling how the U.S. auto industry and its mass-production might helped secure the defeat of the Axis Powers in this terrible conflict. It pains me then to have to point out that the caption for the photograph on page 85 is incorrect.

ORIGIN STORY
Designed by Bantam
Motor Company,
then manufactured
by Ford and Willys.

The caption states that the picture shows an M24 tank being loaded onto a flatcar at the Cadillac plant. While Cadillac did build the M24 Chaffee light tank, the tank in the picture—as well as the others lined up to the left—is actually the M26 Pershing heavy tank. This would make the picture from Chrysler's Detroit Tank Arsenal. Or more likely, as these Pershings are fitted with earlier pattern tracks, from the General Motors Fisher Tank Division's Grand Blanc Arsenal. Both factories built the M26 heavy tank, with Grand Blanc starting first. Just a friendly correction offered from a man who is both a gearhead and a treadhead.

STEVEN J. FOX MERIDEN, CONNECTICUT

On page 86, the photo caption notes that the automakers had shifted to war production by February 1941, and the sign on the Buick calls for total victory. Although U.S. industry was preparing itself and making weapons for Britain before the U.S. entered the war, in February 1941, the U.S. was not yet at war; the Japanese attack on Pearl Harbor was in December 1941. Thus, I think you meant to



READERS ON LOCATION

ROCK YOU Well, this looks like an exciting job, if we do say so ourselves. Here,
Lt. Col. Matthew Muha, commander of the 53rd Weather Reconnaissance Squadron, gets snapped while on duty. What shenanigans are his Hurricane Hunters up to? "Flying through Hurricane Joaquin, the strongest hurricane of 2015 to date," he writes us. Thrilling!

say the shift to war production was complete by February 1942.

KEITH DOLAN BROOKLYN, NY

We're a bit embarrassed at this point. More than that, we're thankful that our readers were able to help us get it (belatedly) right.—Ed.











Parts for Your Car

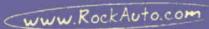


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MOMENT OF

E R





FIRST LOOK | 2018 Lexus LC 500

For Akio Toyoda, president and CEO of Toyota Motor Corporation, the genesis of the Lexus LC 500 grand touring coupe came in August 2011, during the Pebble Beach Concours d'Elegance. As he strolled the famous golf links where hundreds of classic cars from such storied automakers as Bugatti, Ferrari, Jaguar, Mercedes-Benz, and Porsche dotted the perfectly manicured 18th green like precious jewels strewn on a billiards table, inspiration hit him. But what struck him wasn't anything he saw (although as a car buff, surely he was impressed with the jawdropping array of Ferrari 250 GTOs); no, the inspiration came from what he didn't see. Or rather couldn't even picture. Not. One. Lexus.

Then and there, Toyoda-san took the reins of his luxury brand. Lexus, just a couple decades old and a huge sales success in the U.S., needed a jolt. A revolution. A paradigm shift. It was time for Lexus to build cars as desirable and dynamic as they were reliable and quiet. Cars with equal parts sex appeal and spine-tingling performance—eye-catching to gaze upon and, just as important, eye-opening to drive. Luckily, the man needed to lead the charge was standing right next to him.

April 2012

Koji Sato, chief engineer of the LC project, looked at the prototype cobbled from a GS sedan and smiled. He had just put it through its paces at Toyota's Higashi-Fuji Technical Center

proving grounds and knew his team was onto something special. Eight months prior, he had been at Pebble Beach for the launch of the fourth-generation GS, a car for which he also served as chief engineer. But rather than celebrate the GS' debut, his mind had become overwhelmed with the spontaneous and monumental directive his boss had just handed him. And little did Sato know at the time, but the LC's platform would serve as the basis for Lexus' next generation of premium rear-wheel-drive products.

The Frankenstein GS had had its body cut and sewn—front tires pushed forward, engine lowered and moved aft of the front axle for a front-mid layout, battery relocated to the trunk for improved weight distribution, driver hip point shifted down and rearward for better feel and a lower center of gravity—but the powertrain specs and chassis tuning were left intact. Sato-san's objective was to discern whether the fundamentals of the aptly named Inertia Spec platform were alive and kicking or dead on arrival. "I

UNFINISHED BUSINESS
Before chief engineer Koji
Sato drives a shiny Lexus
LC 500, he'll return with a
prototype to the Nürburgring
as well as Toyota's Shibetsu
Proving Ground in Hokkaido
for winter testing.



January 2013

gracing the greens at Pebble Beach.

After a stint in Ann Arbor, Michigan, where he worked on the designs of the Avalon, Camry, and Tundra, Tadao Mori was









assigned back to Toyota City, Japan, where he was given a new task: Shape the LC production car. If Mori-san were learning to swim designing the sedans and truck, he had just jumped into the deep end.

Working off the LF-LC concept, which was penned at Toyota's Calty design studio in Newport Beach, California, Mori aimed to retain the overall taste, surface treatment, and stance of the show car, all while working closely with Sato's team to accommodate the engineering goals. The latter is especially noteworthy because it represents a fundamental shift in Lexus development. Before LC, the process of creating a new platform was a six-year undertaking in which design and engineering predominantly worked separately. For LC, the timeline got fast-tracked to four years, design and engineering coming together as a single team from the

Although the production LC bears a strong resemblance to the concept, every surface is new and every dimension changed. The breadth of the show car's rear was deemed too wide for real-world application (6.6 inches wider than a 911 Carrera S), its roof too low to allow for the luxurious feel and space befitting a Lexus, and its hood and front fenders too close to the pavement for a suspension that needed to accommodate some semblance of wheel travel. So Mori stretched the overall length nearly 5 inches, trimmed the width 2.2, and raised the roof





3.1. And to make the 2+2 layout livable for adults, he lengthened the wheelbase 2.8 inches. All said and done, the LC 500 is larger in every dimension than a Mercedes SL550, but it's tidier bumper to bumper than a BMW 650i, narrower than a Jag F-Type coupe, and shorter in height than an RC F.

When asked how much of the show car was carried over, Mori smiles. "I believe 100 percent," he says, "but with 20 percent of originality added." That 20 percent refers to

the reworked headlights with three supersmall LED units, the revised cabin-to-wheel ratio, and the massaged surfacing and spindle grille. The feature he's most proud of? The profile scoop situated at the lower rear quarter panel. Because the scoop is located "inside the architecture," it required painstaking attention to maintain a pleasing design as well as extensive collaboration with engineering to ensure functional rear brake cooling and an uncompromised structure.

The LC's interior is the nicest to date of any Lexus. Warmer than the LFA's, finer than the LS', more advanced than the GS F's. Interior designer Manabu Ochihata likes to think of it as a place of both driver focus and hospitality, and the small-diameter flat-bottom wheel with magnesium shift paddles mixed with acres of leather and Alcantara and real metal back up that view. The attention to detail is stunning. "Even the smallest switches took a lot of work," Mori says.



LEXUMERA? Sure, this looks like a melted Porsche Panamera, but underneath the heavily camouflaged and chopped GS are the bones of an early Lexus LC Inertia Spec platform.

FIRST LOOK | 2018 Lexus LC 500



CORKSCREWED Randy Pobst rings out the stage-three LC prototype at Mazda Raceway.

August 2015

Right about three years after that momentous trip to Pebble Beach, Sato is back on the Monterey Peninsula, though on this visit the corkscrew he's about to sample has nothing to do with wine. The stage-three LC prototype sits in pit lane at Mazda Raceway Laguna Seca, doors swung open, a team of engineers doing their best impersonation of an ALMS pit crew, jumping in and out of the seats, scampering hastily around the car, and holding laptops and test gear. Sato assures Pobst and me that the mule's upper body resembles that of the forthcoming production car, but the swirling black-and-white

zebra camouflage wrap leaves everything to the imagination.

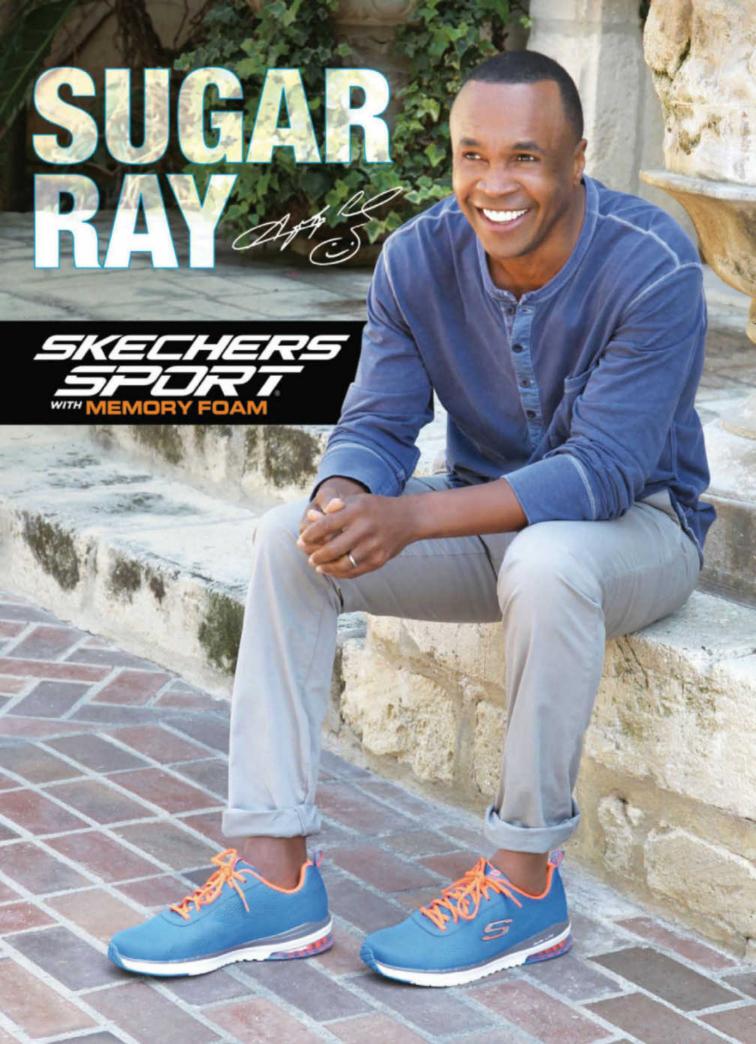
Twenty-inch alloys wearing BMW-spec Goodyears straight from a 650i coupe fill the LC's wheelwells nicely. "Control tire," Sato says, informing us the production LC will have forged 21s shod with next-gen run-flats from Michelin, Bridgestone, and Dunlop. Parked farther down pit lane are a 911 Carrera S, a Maserati Gran Turismo, and the 650i. Pobst will get a handful of laps in the LC only, but Sato's team will sample the others—the BMW as the main target, the Maserati for engine and exhaust reference, and the 911 as the ultimate dynamic benchmark.

tially the same naturally aspirated, 5.0-liter

of torque at 4,800 rpm. It fires up with trackfitting authority thanks to a pair of exhaust sound control valves that open momentarily for full auditory effect. There's even a sound generator in the engine bay to amplify the engine's natural tune under acceleration, achieving a spectral map that approaches that of the V-10 LFA supercar but with more NASCAR rumble, less F1 wail.

After four laps, Pobst returns to pit lane. He's smiling but shaking his head. "Car's really good," he says, "but is there any way to turn off the stability control?" Sato checks







Lexus estimates a sub-4.5-second 0-60 blast for the LC. That seems conservative.

with his team and seems a bit dismayed when he has to report that for now VSC cannot be switched off. Otherwise, Pobst walks away full of praise. "Steering effort and feel are very good-European with some weight but not too much," he says. "The car's front is strong with excellent steering response and very little understeer at the limit. Turn-in generates a small amount of yaw then the car takes a well-balanced set mid-corner. The ride over the minor bumps of the curbs was very good with no vibration, implying a strong body structure." As a racer, Pobst never forgets the brakes. "Brake feel is excellent. Firm pedal, strong bite, smooth ABS. Stable with no noticeable dive."

Sato appears pleased with Pobst's comments, which jibe with the "precise, sharp, and natural" signatures he's aiming to instill in the production car. He leads us through a walk-around of the prototype, pointing out the features he's most proud of. The hood, he says, is lower than the 650i's, a testament to chassis engineer Hiroyuki Masumo, who spent six months perfecting the geometry of the multilink suspension so it could nestle under the steeply raked aluminum yet still deliver accurate, sporty handling. Sato taps the front fenders and doors, noting that both are aluminum, too, as are the front bumper and suspension towers. "We adopted many lightweight items," he says, also calling out that the inner doors and roof are carbon-fiber-reinforced plastic and the trunklid is resin with a sheet-moldedcomposite inner. Finally, he gestures to

2018 Lexus LC 500		
BASE PRICE	\$90,000 (est)	
VEHICLE LAYOUT	Front-engine, RWD, 4-pass, 2-door coupe	
ENGINE	5.0L/468-hp/391-lb-ft DOHC 32-valve V-8	
TRANSMISSION	10-speed automatic	
CURB WEIGHT	4,300 lb (mfr)	
WHEELBASE	113.0 in	
LXWXH	187.4 x 75.6 x 53.0 in	
0-60 MPH	4.3 sec (est)	
EPA CITY/HWY/COMB Fuel Econ	198/130 kW-hrs/100 miles (est)	
ENERGY CONSUMPTION, CITY/HWY	187/120 kW-hrs/100 miles (est)	
CO2 EMISSIONS, COMB	0.96 lb/mile (est)	
ON SALE IN U.S.	Spring 2017	

the lower middle of the driver door. "The heel-to-hip point is 200mm for a low driving position, and that point is 138mm behind the car's center of gravity." Translation: The driver's hip point sits 7.9 inches above his heel point and only 5.4 inches aft of the center of gravity. For comparison, a Jag F-Type's hip point to center of gravity is 14.0 inches. The best? The Porsche Cayman, at 0.

December 2015

Southern California isn't known to be cold in December, but out at the high desert grounds of Willow Springs International Raceway in Rosamond, the early morning temperature hovers around 40 degrees. Luckily, Pobst and I don't need to arrive until the warmer lunch hour, as Sato and his crew are using the morning to work on the performance of the 10-speed auto and to allow their guests from Bridgestone, who have brought the latest iteration of Potenza S001 run-flats, to have a go with the car.

Now in stage-four prototype form—basically stage three with next levels of suspension and transmission tuning—the LC mule looks as chilled as it does tired of wearing zebra camo. But the forged 21-inch wheels with right-size tires (245/40 front, 275/35 rear) lend the car a meaner stance. Sato is quick to point out to Pobst that the VSC can now be switched fully off, which along with the improved shift logic and new tires should significantly improve performance.

Lexus estimates a sub-4.5-second 0-60 blast for the LC, and watching Pobst rocket

STREET-SMART Randy Pobst relays his impressions of the stage-four LC prototype to Koji Sato and Ron Kiino after a dynamic test session at the Streets of Willow Springs.





At last October's Tokyo Motor Show, Lexus showed the LF-FC concept, a strong indication of the style and size of the next-generation LS flagship. When it makes its debut sometime around fall 2017, the LS will be the second vehicle to use Lexus' new Inertia Spec platform.

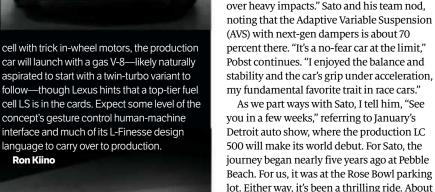
Measuring 208.7 inches long, 78.7 inches wide, and 55.6 inches tall, the LF-FC concept is longer (+2.2 inches) and wider (+3.9) than the Mercedes-Benz S550 but noticeably shorter (-3.1), suggesting the Inertia Spec's lower hip point allowed Lexus to drop the roofline without sacrificing headroom. Lexus didn't release the FC's wheelbase, but it will likely grow from that of the current long-wheelbase LS (121.7 inches) to a span closer to the S550's 124.6, to ensure back-seat room is on par with that of the benchmark Benz.

Although the concept uses a hydrogen fuel



cell with trick in-wheel motors, the production car will launch with a gas V-8—likely naturally aspirated to start with a twin-turbo variant to follow—though Lexus hints that a top-tier fuel cell LS is in the cards. Expect some level of the concept's gesture control human-machine interface and much of its L-Finesse design

Ron Kiino



Word is that Akio Toyoda himself will present the LC at the North American International Auto Show in Detroit. "He drove it six laps last month at Fuji Speedway," Sato says, "and he was very happy with the natural feel and sharp precision." If we're lucky, we'll be back in Detroit in a couple years for the unveiling of the rumored 600-horsepower, twin-turbo LC (LC F, anyone?). But hey, Akio might just save that for a surprise reveal at Pebble Beach.

the time you read this, the stage-five prototype will be built and later validated for final tuning before production begins in late 2016, with sales commencing in early 2017.

1, that seems conservative. Ten laps logged, Pobst pits. "It has made great progress since

my first track drive at Mazda Raceway Laguna

Seca," he says. "The transmission program is

far more refined and smarter with still a bit

more to go. It's light on its feet for its mass,

and the brakes impressed with their power

and lack of fade. At this point, the car is soft

on track and still bottoms easily, bounding

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It's hard to imagine a 600-stallionpower, mid-engine exotic with an avant-garde mix of flowing curves and sharp angles as an underdog, but Lamborghini has been attempting to upstage its aria-singing diva rival for 50 years. I've always admired Ferruccio Lamborghini's artistic drive for meeting the awe-inspiring Enzo Ferrari head on, even in his emblem of the Raging Bull, its aggressive power butting heads with the grace of the Prancing Horse.

I arrive after an awestruck visit with the



SESSION Words Randy Pobst

LP 610-4 PRODUCTION CAR **GT3** FIA RACE CAR EYE OF THE STORM It's not often that we see three Lamborghini Huracáns arrive at once, so we took a spin in each. Randy Pobst says that Ferrari ought to start checking its mirrors.

Ferrari F12tdf in Maranello and find myself awash in a sea of rebel Lamborghinis at Sebring Raceway for the Super Trofeo World Finals. There's a striking corral of neatly lined up Lambo street cars and a first-class Blancpain timepiece hospitality complex teeming with beautiful, well-dressed people of all ages. On the historic circuit where I ran my very first race, I'll try three very different



models: the Huracán LP 610-4, the Huracán LP 620-2 Super Trofeo, and the newborn Huracán GT3, the latter two pure racing cars.

All three start with the same multi-material chassis with a carbon tub connected to aluminum subframes and the latest industrial super adhesives; it's an extremely rigid base. We warm up with the street version, its name



describing its 610 metric horsepower (that's 602 in Yankee horses) and four driven wheels. The Audi-based V-10 has nearly 13:1 compression and peaks its free-breathing power at 8,250 rpm. Yessss. I'm impressed at its thrust as we make almost 160 mph on the straight from Turn 16 to 17. That's more than my old K-PAX Volvo. It's my second time in one of these for MT, and good thing because this one is all over the place, wagging its tail as if it has soft balloons for tires. Back in the pits, I ask for a tire pressure check, and sure enough, it's way off. High, low, all over. Apologies ring,

and I realize that we're the ones who pushed for the street car laps in the first place. No worries. We'd already tested a green Huracán at Big Willow, where I called it "better than any Ferrari ... and by far the best Lamborghini ever," so the lack of a proper test here is no big deal. It was so well-balanced before that I didn't even realize it was all-wheel drive. Well-done—bloody fast, melodious mechanical chorus, and all the right dance moves on track.

Next up, the raging weapon of choice for the all-Lamborghini Blancpain Super Trofeo series, sponsored by one of the oldest watch brands in the world. The LP 620-2 gains 10 ponies (for 612 over here) and loses 300 pounds and two drive wheels to better line up with the pro racing these drivers might well also try. The series includes classes for amateur, pro, and the combination pro/am.

It's very much a drivers' series. Friends tell me to leave the traction control on because the LP 620-2 is a beast coming off the slower corners.

The car I drive is straight from the parc fermé after a strong finish in the last World Final by the O'Gara racing team. It's a paddleshift six-speed transverse Xtrac transaxle with a foot clutch that's needed only for stop/start. The wheel includes dials for ABS (at 4) and traction control (at 7). The power is prodigious and constantly challenges the straining rear tires in second and third gears. I expect this is a real learning curve for the amateur piloti coming out of the all-wheel-drive Gallardo Super Trofeo cars of the last few years. I leave the electronic control right where it is and just lean on the crutch as it allows a nice little powerslide at lower speeds. Insiders tell me the throttle has had a built-in delay added for the benefit of the gentleman drivers, and I feel it, much like turbo lag at low speeds. Floor it early, and the tremendous torque cascades out much later. You've gotta time it just right.

Most impressive is the braking force the Super Trofeo generates from its Pirelli racing slicks, aided by the appreciable downforce. This Lambo is still accelerating madly as I



The power is prodigious and constantly challenges the straining rear tires. I expect this is a real learning curve for amateur *piloti*.







entire suspension, featuring Öhlins shocks, famous for compliance, is re-engineered for racing. Uprights, control arms, and—critically—all mounting points, and hence geometry, were optimized for maximum cornering stick. The svelte body spent countless hours in the wind tunnel with consult from Dallara. With the power restrictions, aero grip with minimal drag is paramount. It continues to be such a pleasure to meet the engineers at this level and feel their passion and pride, but the real proof is in the drive.

I strap in to the new FIA-spec 8862 seat with a 75g rating and notice there's a rescue hatch in the roof. The steering is manual tilt and telescoping, and I just love that, pulling it all the way toward me and most of the way down. There's a hand clutch, but it's only to engage first, neutral, and reverse. Pulling away is handled by the electronics with a funny moan, but hey, no more embarrassing stalls leaving the pits. Not that I ever would.

Chief test driver Fabio Babini leans in



FRUNK Under the lid of the front trunk lives an oversized radiator, a pair of fluid reservoirs, and twin ducts to funnel cool air to hot places, which doesn't leave a lot of room for luggage.

and says, "Eeet's a leeetle pointy," and as I clutch-twootle away and enter the circuit, I immediately have to agree. Right away, I also notice a more supple ride. Two laps in, the car is scaring me in the Green Park transition, and I pit to have the guys check her out. "It's not normal," I say, stepping out on a limb. "Something's wrong. Check the right rear." I am vindicated when they find that wheel coming loose but no damage—yet. I'm proud of that. Back on track, I know in two corners all is well. More than well. The Huracán GT3 is an unbridled joy.

Lap by lap, I go deeper into the brake zones. In spite of its substantial speed, I find myself braking into the corners, not before. I'm blown away by its corner entry capability. Sublime. Attack! My pulse quickens just



ICOMMUNEY			
thinking about it. And the chassis accepts the			
throttle waaay before the Super Trofeo car.			
Prepared to IMSA WeatherTech GTD specs and			
running the Continental spec tires, the green			
machine claws the road tenaciously, making			
those relatively hard tires feel like qualifiers.			
This GT3 slots easily among the very best GT			
cars I've ever driven. Even with no understeer,			

it still inspires confidence and begs for more.

Ferrari better watch its back. As I roll into the pits, the team is all smiles. Fabio throws an arm around me. "Trying to make the young ones look bad, eh?" Leonardo is beaming. They have created a real winner with a whole new level of control above the Super Trofeo. I feel a nice ego boost for turning the lap times, of course, but that was not the goal. The speed has come with very low risk, and that is the best sign of proper handling. Mostly, I feel the satisfaction that comes from using an exceptionally welltuned machine that responds as an extension of my very soul. It's that good. ■

	LP 610-4 (Production car)	Super Trofeo (Series Race Car)	GT3 (FIA Race Car)
BASE PRICE	\$242,445	\$325,000	\$505,000
VEHICLE LAYOUT	Mid-engine, AWD, 2-pass, 2-door coupe	Mid-engine, RWD, 1-pass, 2-door coupe	Mid-engine, RWD, 1-pass, 2-door coupe
ENGINE	5.2L/602-hp/413-lb-ft DOHC 40-valve V-10	5.2L/612-hp/420-lb-ft DOHC 40-valve V-10	5.2L/577-hp/396-lb-ft DOHC 40-valve V-10
TRANSMISSION	7-speed twin-clutch automatic	6-speed manual clutch sequential manual	6-speed auto-clutch sequential manual
CURB WEIGHT (F/R DIST)	3,419 lb (42/58%)	3,100 lb (est)	2,710 lb (mfr)
WHEELBASE	103.1 in	103.1 in	103.1 in
LXWXH	175.6 x 75.7 x 45.9 in	175.7 x 78.0 x 44.5* in	175.5 x 80.7 x 44.5* in
0-60 MPH	2.8 sec	3.0 sec (est)	2.8 sec (est)
QUARTER MILE	10.6 sec @ 132.8 mph	Not tested	Not tested
EPA CITY/HWY/COMB Fuel Econ	14/20/16 mpg	Not tested	Not tested
ENERGY CONS, CITY/HWY	241/169 kW-hrs /100 miles	Not tested	Not tested

Not tested

Currently

Not tested

Currently



2015 Lamborghini Huracán

*Not including rear wing

1.20 lb/mile

Currently

CO2 EMISSIONS, COMB

ON SALE IN U.S.

TAKING THE ALL-WHEEL-DRIVE SADDLE OFF THE HURACÁN MAKES IT BETTER

You have to love a press conference that avoids unverifiable claims of 300 percent more torsional rigidity and meaningless promises of added dynamism. Instead, the 2016 Lamborghini Huracán LP 580-2's trackside presentation contained at least a dozen references to power oversteer. Auto enthusiasts know this doesn't describe the superior position a cattle rancher exercises over male livestock. Rather, it's what happens when a properly improper amount of power is sent to the tires of a rear-wheel-drive car while driving around a bend. Old-timers call it "loose," kids call it "drifting," and we call it brilliant—nothing is as rewarding as balancing a car on the edge with the throttle.

Fundamentally, Lamborghini removed the front-driven axle from its mid-engine, all-wheel-drive LP 610-4, shaving 73 pounds from the LP 580-2's new nose, which in turn results in a not-insignificant 2 percent shift

in weight distribution toward the restyled rear of the car. While they were at it, they relaxed the car's front springs and anti-roll bars, added more positive camber, revised the electric-assist power steering, and altered the construction of its Pirelli P Zero tires. Two of the three electronic overlords were tuned to exploit the desired effects. No longer a 602-horsepower tempest in an AWD teapot, the 571-horse Huracán LP 580-2 nearly maintains its stablemate's 5.7 pounds-perhorsepower value (at 5.9) and finally allows the baby Lamborghini to kick its tail out through corners. Most important, however, these revisions supply the sort of fine frontwheel control and dynamic balance only a rear-drive car can deliver. The LP 580-2 has the best steering response, precision, and feel of any Lamborghini we've ever driven.

Although they wouldn't flat-out say it, the Lambo officials insinuated (and our prior experience suggests) that the 580-2 would make a slower lap than a 610-4 simply because the latter can drive out of corners better with all-wheel drive. But that's not the point of this car. It's meant to be more fun and less expensive, and it is indeed both.

The 580-2 will also be slower to 60 mph. Even with its own baked-in launch control and the same seven-speed dual-clutch automatic transmission, the RWD Huracán will never launch as well as the AWD version. Last time we tested an LP 610-4, we clocked it at 2.8 seconds to 60, and we estimate the LP 580-2 will do it in 3.3 seconds—if and only if its non-adaptive launch control is effective.

Our day consisted of flinging the 2016 Huracán LP 580-2 to our heart's content around Losail International Circuit in Doha, Qatar, a 3.34-mile track that hosts a nighttime MotoGP race every spring. With both fast sweepers and tight corners, the circuit allowed us to sample a wide range of cornering speeds from 40 to nearly 100 mph.





With the drive-mode selector in either Sport or Corsa, slow- to medium-speed corners would elicit mild understeer that could either be transformed into oversteer with more throttle or, if that didn't work, the time-honored lift-stab of the throttle to transfer the weight to the front and break the rear loose. And with that revised steering system, feeling and catching the drift while balancing the car until the straight bit arrived was as entertaining as it was intuitive. That's what makes this the better Huracán and perhaps the best modern Lamborghini: information streaming from the car, more dynamic variables available, and more tools in the driver's toolbox.

The LP 580-2 fulfills its mission as a thrilling and capable sports car that just happens to look like a supercar. Howling front tires and heavy, reluctant steering let the driver know the car's front grip is at its peak. Either be satisfied knowing this is the limit until the straight arrives, or whack the

throttle to break the rears loose and crank the talkative wheel in the opposite direction for a little fun. Your choice. These sorts of sensations and options simply don't exist in the LP 610-4. Don't get us wrong. We still love the AWD Huracán. This one is just more pure—like riding barebacked instead of saddled.

We did find a couple faults, however. Occasionally while in automatic mode, the transmission preselected the next-higher gear, anticipating steady acceleration, but we instead went to full throttle, and it stumbled for a moment while reselecting the lower gear for a kickdown. Most dual-clutches are susceptible to this, but it happened each time we exited a particular corner. Also, even with the optional carbon-ceramic brakes and magnetorheological dampers, it was unnerving to slow the car from about 165 mph on the 3,500-foot front straight. There was perhaps a little too much weight transfer under this extreme braking because the rear of the car got very light and wiggly. Combine that with an initially soft-feeling brake pedal

2016 Lamborghini Huracán LP 580-2 **BASE PRICE** \$204,895 Mid-engine, RWD, 2-pass, 2-door coupe **VEHICLE LAYOUT** 5.2L/571-hp/398-lb-ft DOHC 40-valve V-10 **ENGINE** TRANSMISSION 7-speed twin-clutch auto **CURB WEIGHT** 3.350 lb (est) 103.2 in WHEELBASE 175.6 x 75.7 x 45.9 in LXWXH 0-60 MPH 3.3 sec (MT est) EPA CITY/HWY/COMB Fuel econ 14/21/17 mpg (est) 241/160 kW-hrs/100 miles CITY/HWY CO2 EMISSIONS, COMB 1.18 lb/mile (est) ON SALE IN U.S. March

and ABS that nearly locks brakes, and it had us backing up our braking zone by about 100 feet. These are extreme conditions, however, likely never experienced by most buyers.

Starting this month, Lamborghini's asking price for the more engaging Huracán LP 580-2 is \$37,550 below that of the LP 610-4. At \$204,895, the 580-2 is nearly nose-to-nose with the McLaren 570S on price, performance, and entertainment value. The Audi R8 V10 Plus, which shares myriad LP 580-2 parts, is also a competitor. Finally, the Porsche 911 GT3 is in this low six-digit neighborhood, as well, and wouldn't this be a terrific multicar comparison test? Until then ...





HEART OF A HEAVY-DUTY. SENSE OF A LIGHT-DUTY.

Proudly introducing the TITAN' XD — the Every Duty Truck."

- Cummins V8 Turbo Diesel
- Integrated Quick-Release Gooseneck Hitch*
- Hydraulic Body Mounts
- Zero Gravity Seats







FIRST TEST

more than 15 years (2001 was the first U.S. model), and these virtues vaulted the secondgeneration car to a 2004 Car of the Year win.

However, aside from miles-per-gallon tales and cents-per-mile costs, the Prius traditionally has given us little to get excited about. What's that saying about familiarity and contempt? The power-split planetary gearset is neat, but it's hard to make a case that all aspects of the driving experience are cool. Luckily for us, Toyota wanted to make the new fourth-gen much cooler all around.

Associate editor Christian Seabaugh attended the 2016 Prius' press launch at one of the car's new natural environments: an autocross course. "Prius autocross? Really?" Seabaugh said. "My skepticism was further enhanced by a quick refresher lap of the course in a 2015 Prius. It was everything I remembered: slow, heavy steering, poor body control, bad brake pedal feel. Not fun."

And this press event was put on by Toyota. But what did Seabaugh think of the 2016 car? "There's a night and day difference dynamically between the new car and the last one," he said. "The new chassis feels so much livelier than the old car's. It can take the power what little there is—and really put it down well. Steering is relatively precise, brake pedal feel is very good for a hybrid, and while flatout acceleration will never be described as fast, it's certainly good enough. Dare I say it? The new Prius really borders on fun."

Those familiar with three generations of Priuses might be feeling a pang of the vapors. Testing director Kim Reynolds noticed the

2016 Toyota Prius		
BASE PRICE	\$25,035	
PRICE AS TESTED	\$30,835	
VEHICLE LAYOUT	Front-engine, FWD, 5-pass, 4-door hatchback	
ENGINE	1.8L/95-hp/105-lb-ft Atkinson-cycle DOHC 16-valve I-4 plus 71-hp/120- lb-ft electric motor; 121 hp comb	
TRANSMISSION	Cont. variable auto	
CURB WEIGHT (F/R DIST)	3,087 lb (61/39%)	
WHEELBASE	106.3 in	
LXWXH	178.7 x 69.3 x 58.1 in	
0-60 MPH	9.7 sec	
QUARTER MILE	17.4 sec @ 77.6 mph	
BRAKING, 60-0 MPH	115 ft	
LATERAL Acceleration	0.82 g (avg)	
MT FIGURE EIGHT	27.8 sec @ 0.61 g (avg)	
EPA CITY/HWY/ COMB FUEL ECON	54/50/52 mpg	
ENERGY CONS, CITY/HWY	62/67 kW-hrs/100 miles	
CO2 EMISSIONS, COMB	0.37 lb/mile	

blistering-for-a-Prius 27.8-second figure-eight time. It's the first time a Prius has dipped into the 27-second range. "Much better," Reynolds said. "Turns in almost too well, as it reacted more quickly than I expected. Basically a lot of understeer and not much feel. But the steering has more gain and quickness."

Toyota's investment in the Toyota New Global Architecture with front strut and multilink rear suspension appears to pay more connected to the road. The TNGA chassis targets a low center of gravity, and you won't miss it from the driver's seat. I found myself tiptoeing up curbside lips in fear of scraping the front end. The Prius never made any characteristic scuffing sounds.

At 9.7 seconds to 60 mph and 17.4 seconds through the quarter mile at 77.6 mph, the genfours are about as quick as the gen-threes. The 2016 car has a lower hybrid system power rating-121 hp to 2015's 134-but I didn't detect a negative impact. The highlight of the new powertrain—the re-engineered 1.8-liter engine and new (yet familiar) planetary-type continuously variable automatic, electric drive motor, and lithium-ion battery-is how it substantiates itself in everyday driving conditions. The car stays in full-electric driving more often and more easily than the last model while employing normal gas pedal usage. And when it does need to turn on, the engine isn't as noisy. The brakes do exhibit some hybrid grabbiness deeper in the pedal stroke. But there's always the fuel economy payoff. No way around it, the Prius' EPA 54/50/52 mpg city/highway/combined is stellar. (Real MPG is 56.4/57.3/56.3.)

There's also no way around the bodywork. The new Prius has a dramatic, Mirai-inspired appearance. I suspect some people will think it looks cool. That's at least a start. ■

REFORMED Only the base Toyota

Prius Two retains a nickel-metal

hydride battery; all others convert



What Is Power and What Should It Mean?

To parents of a teenage driver,

power is a yardstick by which to guess if a certain car would be a good idea (higher is always worse) for their baby. To others, it's a way of showing they're a big man/woman who can "handle the beast" or some other eye-roll idiom. To physics textbook authors, it's the time rate of energy transfer.

To Argonne National Laboratory's Mike Duoba and his SAE J2908 (Hybrid System Net Power Rating) task force, the net power of a hybrid powertrain is material for serious debate. Rating a car's combustion engine by its lonesome is easy peasy by current J1349 and J2723 standards: test the engine as it'd be dressed and installed for customer consumption, right at the crankshaft. But for a hybrid system—where two (or more) propulsion components and two (or more) energy storage mediums are in play—its energy management can be highly unpredictable.

Automakers haven't collectively agreed on a single harmonized procedure to rate their hybrid powertrains. They aim to make it as similar to current engine-only ratings as possible, but hybrid configurations are highly diverse. Toyota's change in rating technique influenced the 2016 Prius' lower system horsepower. Some manufacturers prefer quantifying their gas/electric setup's engine and battery separately, have the battery stand in for e-motor power, and then sum the outputs (Plan A).

Some elect to move further downstream in the powertrain and look at the cumulative shaft output so it's more compatible with how a standalone engine is measured (B). Argonne's preliminary testing demonstrated one constant variable: A hybrid car won't always

report the same output using two different methodologies.

Enter J2908, which looks to level the hybrid net output playing field between the manufacturers by recommending specific testing protocols for defining power. A catalogued resolution has yet to be etched in stone. Concerns include the ability to authenticate automaker claims (Are ratings based upon test measurements or estimations?) and whether the greater public will be able to easily comprehend and compare the figures (a weighty issue, as some individuals still believe in the veracity of old-school SAE gross

LAID BARE Sexy parts such as the engine, e-motor, and battery grab attention. The cabin heater, A/C compressor, and right engine mount are more efficient, as well.

numbers). In addition to the two approaches outlined above, determining power at the axle or wheels is a direction the committee is seriously considering (C). Rating power at the wheels may offer the best chance of "future-proofing" the vehicle power rating so that all types of powertrains now or in the future can be faithfully compared to each other.

A workable J2908 draft is expected mid-2016. Duoba is genuinely curious about which approach would feel the most valuable to you, fair reader. A, B, C, or another solution not presented here? Benson Kong





AUDI BRINGS THE RIGHT CAR AT THE RIGHT TIME TO THE RIGHT MARKET



FIRST TEST | 2017 Audi Q7

get a chance, examine the character line that begins at the headlight and flows into an arch over the front wheel, disappears into the front door, and re-emerges two-thirds of the way down the rear door before terminating into the taillight. Simply masterful, especially considering the doors are aluminum and the rest of the body is steel. Trouble is, unlike the last one, the new Q7 just doesn't look good. Great details (like the "double arrow" headlights) yes, but overall? Plain Jane.

But hey, this is an Audi after all, and if the outside looks don't wow you, the interior surely will. What an interior! The nicest change is Audi's move away from red graphics to much more elegant and mature white lettering on the buttons. While the Q7 is fractionally narrower than the rig it replaces, you'd never know that from looking at the dashboard, which features a long row of rectangular air vents that trick you into thinking it's wide. I can't get enough of Audi's virtual cockpit, the 12.3-inch TFT screen that replaces all the gauges just like in the new TT, R8, and A4. It's big, bright, lovely to look at, and easy to use, and I predict many competing manufacturers will offer something quite similar, quite soon. Specifically the big, zoomable



2003 Audi Pikes Peak Quattro Concept

As we sent this issue to the press, Audi was on track to sell nearly 200,000 vehicles in the U.S. in 2015, and more than 80,000 of them were SUVs. You can trace every sale back to a not so distant ancestor: the 2003 Pikes Peak quattro concept. First shown at the 2003 Detroit auto show, the Pikes Peak quattro was part of a trio of concepts that blueprinted Audi's future. The Pikes Peak became the first-generation

quattro concept started it all.

concepts that blueprinted other vehicle Audi's future. The Pikes Peak became the first-generation

BLUE DADDY The Pikes Peak

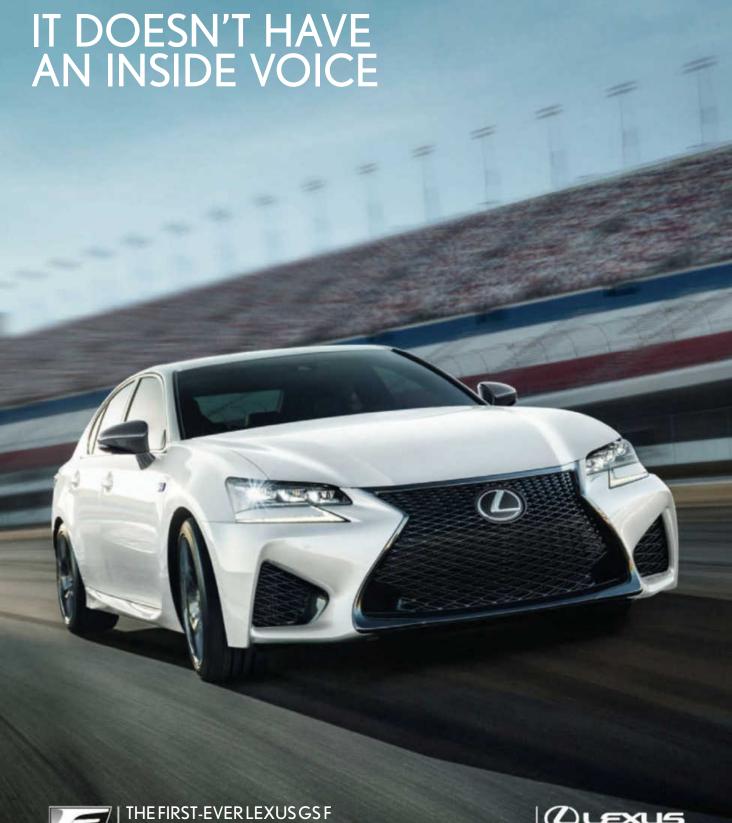
Q7, the Nuvolari concept became the lovely A5, and of course the Le Mans concept became Audi's brand halo, the mighty R8.

the mighty R8.

Taken as a whole, the three represent the most comprehensive and well-sorted set of concept cars ever shown. In terms of impact, the R8 has done more to lift Audi in people's minds than any other vehicle. That's

main reasons, if not the main reason, you build supercars. The A5 is little more than a design master flexing his or her design muscles. But in terms of stuffing euros into Ingolstadt's coffers? No vehicle in Audi's history can hold a candle to the cha-ching of the Q7 or the importance of the Pikes Peak concept. **Jonny Lieberman**







There's a time and a place to dial it back. This is neither. The new GSF boasts a race-inspired 467-horsepower¹ V8 engine and a throaty exhaust note that's impossible to ignore. Add in a Torque Vectoring Differential, plus six-piston Brembo® front brakes,² and it makes more than a powerful statement: It makes the 2016 Lexus GSF as capable in overall handling as the 2016 BMW M5.3 | lexus.com/GSF | #LexusGSF



1. Ratings achieved using the required premium unleaded gasoline with an octane rating of 91 or higher. If premium fuel is not used, performance will decrease. 2. High-performance brakes may require additional maintenance and be louder than conventional brakes, depending on driving conditions. See the Warranty and Services Guide for more information. 3. AMCI Testing Certified: 2016 Lexus GSF versus the 2016 BMW M5 with optional 20-inch wheels with ESC off. © 2015 Lexus



map, as well as the ability to shrink the speedometer and tachometer, freeing up valuable real estate. As has long been the case, Audi's open-pore woodwork is the envy of most.

Speaking of valuable real estate: "Why are we even doing this?" my friend's 9-year-old son said to me as I peered into the third row and noticed his knees were touching the back of the seat in front of him. His 7-year-old sister seemed to fit pretty much OK. I decided to toss some kids in the way back because I'd earlier tried to shoehorn in my 5-foot-11-inch self and literally could not fit. (I know what literally means.) The Q7's middle row is cleverly split 35/30/35, and the two end chairs tumble forward to allow relatively easy access to that third row. But once I was sitting in the third row, I simply could not flip the seat



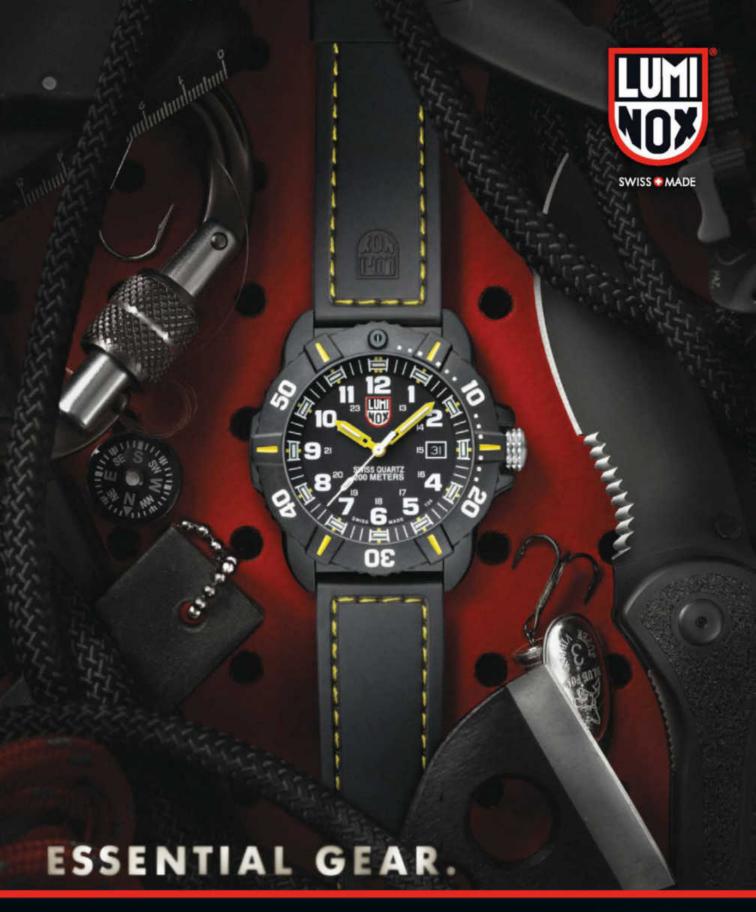
back into place. My knee was in the way. Now, you can individually slide each middle seat forward a few inches, and it does make the third row tolerable for a 9-year-old. Adults? Still cramped, and now the second row is no bueno, too. Why didn't they—or couldn't they—stretch MLB Evo out another couple of inches? Dunno, but to me this is problematic. Kids eventually turn into teenagers, after all. All that said, with the seats pushed all the way back, the second row is quite commodious.

Audi chose to launch the Q7 by sending us auto journo types on an eight-hour romp through some of the most beautiful parts of California's northern wine country. That's Napa, Sonoma, and Mendocino for you terroir geeks. First big impression is that the Q7 is calm and quiet. Audi did an amazing job tamping down road and more importantly tire noise. No easy feat, especially with the big optional wheels and tires. I had a chance to drive a few different Q7s, including one with standard steel springs and a couple of others with optional air suspension and all-wheel steering. Here's the part Audi's not going to like: The standard suspension feels better. True, the air suspension allows for 4.5 inches of ride height adjustment-from load to off-road—and the all-wheel steering cuts more than 3 feet out of the vehicle's turning diameter. I'll even allow that yes, having the

rear wheels move in parallel (up to 2.5 degrees above 25 mph) does make for defter handling and improved emergency safety reflexes. But I prefer the way the standard car drove. The steel springs were less bouncy, and as a result the Q7 felt better tied to the pavement.

We're talking about 10 percent better than the air-sprung version, and either setup allows the Q7 to ride incredibly well for a 2.5-ton SUV. Well, in the case of the latter, 5,103 pounds, as we were able to get a highly optioned Q7 to our test track. The last Q7 we tested—a 2011 Premium Plus TDI model with an eight-speed transmission—weighed in at 5,402 pounds. The last gasoline-powered Q7 we ran numbers on had the old 3.6-liter V-6, a six-speed automatic transmission, and came in at 5,324 pounds. Thanks to a whole bunch more aluminum, you can see for yourself that the 2017 Q7 is lighter than the car it replaces. But our scales don't jibe with Audi's claim that the new rig is 474 pounds lighter. Still, considering how much equipment and capability the second-gen Q7 has added, a couple hundred pounds less lard is a step in the right, light direction.

For now, the only engine available on the 2017 Q7 is the 3.0-liter, supercharged V-6 that Audi still annoyingly badges as 3.0T. Of course, Audi also said its diesels were clean. Speaking of which, you can't get a TDI Q7 for



Coronado 3025: 44mm, carbon reinforced polycarbonate case with stainless steel screw case back, tempered scratch resistant mineral crystal, multi-jewel Swiss quartz movement, water resistant to 200 meters, signature black rubber strap with contrast stitching, and Luminox self-powered illumination. Swiss Made.

Preferred timepiece of Elite Special Forces Worldwide.





I can't get enough of Audi's virtual cockpit. It's big, bright, and lovely to look at.





now, and there's no word on when you will be able to. All I could get out of Audi people was "when it's ready." A 2.0-liter, turbo gasoline version is coming—we assume it will be the same version of VW Group's TFSI inline-four as is found in the A6. The Q7 is the platform mate of the Bentley Bentayga, so we know that the 4.0-liter, twin-turbo V-8 would fit perfectly (hint: SQ7, coming eventually). The 3.0-liter V-6 makes 333 horsepower and stumps up 325 lb-ft of torque. All that forward thrust is good for a 0-60 time of 5.7 seconds and a quarter-mile sprint of 14.3 seconds at 97.5 mph. It's no R8, but those numbers smack the meatballs out of its natural rival, the 2016 Motor Trend SUV of the Year-winning Volvo XC90 (0-60 mph in 6.7 seconds, quarter mile in 15.1 seconds at 90.4 mph for the T6). The new Q7 can stop from 60 mph in 117 feet and complete our figure-eight test in 26.5 seconds. For comparison, the Volvo needs 113 feet and 26.8 seconds. Both tall wagons pull an average lateral grip of 0.85 g.

The Q7 is thick with safety aids. Aside from the usual suspects, such as the ability to detect objects in front of you (collision avoidance/ auto braking) and rear cross traffic alert, you get slick new stuff such as traffic jam assist and turn assist. Traffic jam assist uses the radar cruise control and a high-mounted camera not only to keep up with traffic but also to stay in the lanes. You can even take your hands off the wheel for a few moments (say, to open a water bottle) and the Q7 won't drift into a wall. In theory. In reality, I took a 450-mile road trip using TJA most of the way, and it worked most of the time. On two occasions, however, the Q7 began forcibly applying the brakes for no perceptible reason. The lane keeping would work only intermittently, similar to how the same system worked on the new A4 I drove. Turn assist is a safety system that prevents you from turning into oncoming traffic. Weirdly, it's only active



2017 Audi Q7 3.0T Quattro		
BASE PRICE	\$55,750	
PRICE AS TESTED	\$72,875	
VEHICLE LAYOUT	Front-engine, AWD, 7-pass 4-door SUV	
ENGINE	3.0L/333-hp/325-lb-ft supercharged DOHC 24-valve V-6	
TRANSMISSION	8-speed automatic	
CURB WEIGHT (F/R DIST)	5,103 lb (55/45%)	
WHEELBASE	117.9 in	
LXWXH	199.6 x 77.5 x 68.5 in	
0-60 MPH	5.7 sec	
QUARTER MILE	14.3 sec @ 97.5 mph	
BRAKING, 60-0 MPH	117 ft	
LATERAL Acceleration	0.85 g (avg)	
MT FIGURE EIGHT	26.5 sec @ 0.67 g (avg)	
EPA CITY/HWY/COMB Fuel Econ	19/25/21 mpg (est)	
ENERGY CONS, CITY/HWY	177/135 kW-hrs/100 miles (est)	
CO2 EMISSIONS, COMB	0.91 lb/mile (est)	

TOUCH ME Why yes, we do believe that's the largest touchpad in the industry.

CARLIKE As large as the Audi Q7 is, from behind the wheel you'll swear you're in a car. The fourwheel steering is a must have for parking lots.

if you put on your blinker. One would think that the person who doesn't bother with a turn signal would be more prone to getting T-boned. Anyhow, Audi had an engineer demo turn assist to me. It worked two out of three times. Good, but not good enough. No manufacturer's system is truly ready for prime time, though. I clearly remember a Mercedes-Benz S-Class trying hard to accelerate me into the back of a merging semi truck.

The Q7 is not perfect. But it is quite excellent. Most criticisms can be spun away: The third row is meant for children; traffic jam assist kept me out of at least one accident; the air suspension is intended for those that spend time in the mud. As for the looks, while I don't find the new Q7 attractive, I have to admit it does look premium and worth the \$55,750 base price. The Q7 is comfortable, luxurious, quiet, technically compelling, good enough to drive, and, most important, quite an appealing option in a lucrative and growing segment. Is the big Audi better than our 2016 SUV of the Year, the Volvo XC90? And what about the refreshed Mercedes GLS? Or the Range Rover Sport? Only time-meaning a future comparison test-will tell. Until then, and regardless of the outcome, I fully expect the 2017 Audi Q7 to be another chapter in the ongoing Audi sales success story.







COMPACT COMPETITOR GETS BIGGER, MORE WORTHY OF "PREMIUM" LABEL

Car manufacturers love finding metaphors for their new vehicles at press launch events. Want to highlight the modern design of your new sports car? Barcelona and its architecture! A rugged truck? Baja, California, or the Pacific Northwest! For the launch of the 2016 Mini Clubman, the company chose Savannah, Georgia, a "compact" (if you will) city with a deep colonial heritage, once isolated but now embracing growth via tourism and a large, successful art school.

Many Mini fans fervently embrace its British heritage. But to attract mainstream customers who aren't brand loyalists, the automaker has to produce cars more users find friendly. One thing is for sure: They've had it with the "Mini became maxi" cracks that came with the release of the 2015 Mini Hardtop 4 Door. (One of our 2015 Car of the Year judges, Chris Theodore, said that that Mini kept becoming a "caricature of itself" with each larger iteration.) In the minds of Mini's designers and their Bavarian overlords,

their products must grow and evolve.

Enter the 2016 Mini Clubman with its signature elongated look and split rear doors. At 168.3 inches, the 2016 Clubman is a little more than a foot longer than the previous Clubman. It's also 4.6 inches wider, and the wheelbase grows by almost 5 inches to 105.1. The only place it didn't really grow was in height, where it sits at 56.7 inches.

Those new dimensions—it's now only 7 inches shorter in length than the Mazda3 hatchback-make huge differences in

FIRST DRIVE | 2016 Mini Clubman

perceived space, especially shoulder room and rear-seat space, and result in fewer of the overall compromises Mini has been known for.

We took an eight-speed automatic Cooper S Clubman and a six-speed manual Cooper Clubman from the moss-covered squares of downtown Savannah down through the scenic low country to grand Jekyll Island and back. The S wagon, powered by the 2.0-liter four-cylinder turbo making 189 hp and 207 lb-ft of torque, felt pleasingly quick. The eight-speed automatic was smooth and did a good job of finding appropriate gears without constantly seeking the lowest rpm possible.

Our Cooper Clubman's manual had good clutch action and easy-to-find gates in the quiet, smooth shifter. It was well-matched to the 1.5-liter three-cylinder turbo that creates 134 hp and 162 lb-ft. If you've scoffed at threecylinder engines before, this one may change your mind. It's well-refined, and unlike some small engine/manual combos, this one doesn't scream at you at speed. We were running at a quiet 2,000 rpm at 70+ mph.

Unfortunately, there was no three-cylinder/ six-speed automatic vehicle present. Most buyers will choose between the manual and the eight-speed automatic.

Steering is up to Mini standards and feels firm but not heavy. They don't exactly have mountain-style twisties in the low country, but the handling was precise and predictable. Weighing in between 3,100 and 3,300 pounds based on powertrain, the Clubman did not feel heavy, which was a common complaint about the 2015 Hardtop 4 Door.

The start/stop function on both powertrains needs to be improved if anyone is ever going to use it regularly. As we noted in our First Drive of the 2015 Hardtop 4 Door, the "stop" is fine, but the "start" is a bit rough, noticeable, and depending on your accelerator action can result in a jerky start. Another nod to the future: A new electric parking brake operated single-finger style.

have questioned the value proposition of the new Minis. The interior materials feel far more premium, a word used repeatedly by Mini execs, with better trim, softer plastic on the doors, and even an optional nifty ambient lighting system that shines through a specially mottled door panel. And it's remarkably quiet inside. Even over rough pavement, conversations could be had at normal volume at speed. Finding a good driving position was easy, and the seats come with manually adjusted thigh support extensions.

safety tech to the table. With the Driving

interior that takes a big leap toward living up to the premium pricing. control, collision and pedestrian warning with initial braking, high-beam assist, and road-sign detection. We doubt customers would prefer the side-view mirror logo projector (comes standard!) to a backup camera (still optional!), but it is a nifty nighttime conversation starter. It can also be had with the de rigueur but questionably useful









gesture-controlled opening of the rear doors.

Mini is pressing ahead with its quest to produce more cars sized for the mainstream. No longer content to be the tiny rebel, Tom Noble, Mini's GM for marketing, says the company wants you to think of the Clubman as the "cool uncle" in the family. The 2016 Mini Clubman lives up to the promise of



VEHICLE LAYOUT

ENGINES

TRANSMISSIONS

CURB WEIGHT

WHEELBASE

LXWXH

0-60 MPH

EPA CITY/HWY/ Comb fuel econ ENERGY Consumption, City/HWY

CO2 EMISSIONS,

ON SALE IN U.S.

Front engine, FWD, 5-pass, 4-door wagon

1.5L/134-hp/162-lb-ft turbocharged DOHC 12-valve I-3; 2.0L/189hp/207-lb-ft turbocharged DOHC 16-valve I-4

6-speed manual; 6-speed automatic; 8-speed automatic

3,100-3,300 lb (mfr)

105.1 in

168.3 x 70.9 x 56.7 in

6.9-8.9 sec (mfr est) 22-25/32-35/26-27 mpg

140-153/99-105 kW-hrs/

0.70-0.76 lb/mile

Currently

being a full-blown compact car and seems to be the one that would fit the bill for lots of people. A big question with Mini's previous offerings has always been one of value. With refined powertrain options and an interior that is nicely catching up to Mini's price points, that will be less of an issue.

But a dynamic tension between Mini's heritage and its future, more mainstream offerings will always remain. During a presentation by Noble, someone asked a question. "How many of your buyers know the cars are assembled in Oxford?" A member of the dedicated Mini press harrumphed, "98 percent!" The executive said it was probably more like a third. If they can create more cars like the 2016 Clubman, the real answer will be, "Who cares?" ■

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Bold prediction time: The vehicle you see here will one day become Toyota's best-seller. And I'm not the only one who believes that. At the updated 2016 RAV4's debut, Toyota said that it expects its compactish crossover to one day crest the 400,000 sales marker, beating the mighty Camry in sales. Vehicles such as the 2016 Toyota RAV4 Hybrid—a big new addition to the larger updated 2016 RAV4 lineup—will also serve as an important step toward Toyota's goal of selling mostly emissions-free vehicles by 2050.

The RAV4 was always a strong player in the segment (in November, the RAV4 overtook the Ford Escape for second place in the compact crossover sales race), but Toyota found that many of its most loyal customers were unhappy with how carlike their formerly rugged CUV had become when the fourth-generation model debuted in 2013. Customers were also displeased with the hard plastics inside and excessive noise, vibration, and harshness.

The updated RAV4 does much to win back the favor of those customers. For starters, the RAV4 gets a nose lift to give drivers a more SUVish look over the hood. With the lift comes a new front end with a revised grille, new LED headlights, and a faux skidplate, all of which help improve the RAV4's aerodynamics. The design is tidied up in the rear with a new bumper and new taillights, and revised rocker panels tie the whole design together along the RAV4's profile.

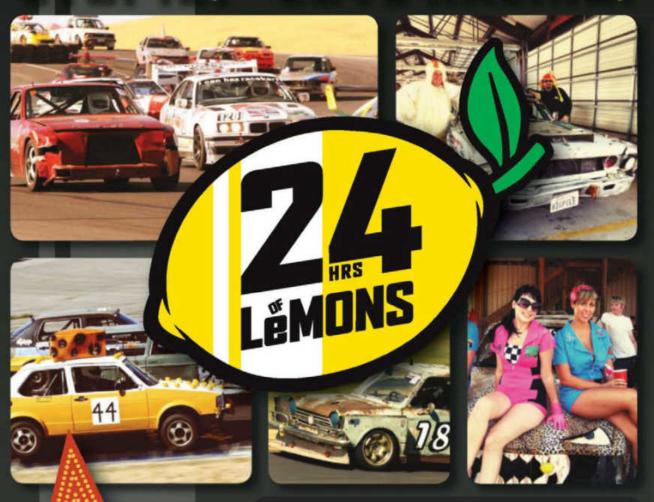
Inside, the ragtag combination of plastic, pleather, and contrasting finishes has been simplified for a more premium design. The bones of the interior are the same, but the fit, finish, and quality of the materials have vastly improved. Take the door cards, for instance. Toyota said that customers complained about the feel of the hard plastic upper section of the door on their arms, so Toyota fixed the issue with soft-touch padding. The automaker also added soft-touch padding to the dashboard, put in a new steering wheel, and revised the center console's design and trim. The cabin is finished with extra sound deadening under the floors and in the doors.

The gas version's 2.5-liter, 176-hp I-4 is unchanged, but the RAV4 Hybrid is the final piece of the puzzle. Like the Camry Hybrid it shares its major powertrain components with, the RAV4 Hybrid has a 112-hp, 2.5-liter Atkinson-cycle I-4 mated to a continuously variable hybrid transaxle containing two electric motors. The traction motor, dubbed Motor Generator 2 (MG2), works as we've come to expect of hybrid-electric motors: assisting the internal combustion engine while accelerating, taking over under lowload cruising, and providing regenerative assist to the braking system. The smaller of the two motors, MG1, functions both as a starter for the engine and as a generator for the battery pack and three electric motors. Yes, three: All RAV4 Hybrids are all-wheel drive with a third, rear-mounted electric motor (called MGR) for additional traction and power to the rear wheels. There is a lack of mechanical linkage between the axles; with a 67-hp rating, the rear motor can provide a significant chunk of total drivetrain



VIEW MASTER The hybrid powertrain is a thing of engineering beauty. The infotainment display can show the engine and motors trade off work.

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AUG 27-28 The Ridge Mtrspts Park, WA

OCT 1-2 Buttonwillow, CA

DEC 3-4 Sonoma Raceway, CA

SOUTH

FEB 6-7 Barber Motorsports Park, AL

APR 30-MAY 1 Carolina Motorsports Park, SC

SEPT 17-18 Carolina Motorsports Park, SC

MIDWEST

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JUNE 4-5 High Plains Raceway, CO

JULY 23-24 Autobahn Country Club, IL

OCT 8-9 Gingerman Raceway, MI

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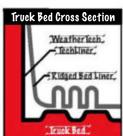


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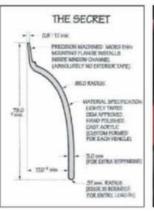
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I'm at Autodromo Vallelunga, a little north of Rome, about to thrash on the World Touring Car Championship Polestar S60, Volvo's brand-new, one-of-a-kind-so-far return to the international stage. Having driven the Volvo North America-supported K-PAX Racing S60-R for years, I'm well-acquainted with Polestar, the recently acquired performance division of Volvo Sweden. Their relationship is much like that of Mercedes and AMG, including factory performance parts and even special models, happily available in the States, too.

Many racing series use ground-up race car designs with a tacked-on silhouette body, which is a practical solution for competition, but manufacturers often are drawn



to regulations that use much more of the original road car for greater relevance. In many series with the title Touring Car, this is the case, including North America's Pirelli World Challenge.

This S60 WTCC race car is the product of Volvo/Polestar and Cyan, the racing side of

Polestar, spun off when Volvo took Polestar in-house not long ago. The formula for the series is only a year old and attracted Volvo as a place to showcase the strengths of the road car, discover ways to improve it, and develop ideas for Polestar high-performance upgrades for the street.

All cars in the series are front-wheel drive, and they all deliver a challenging 400 hp and 332 lb-ft of torque, exceptionally high for the configuration. The rules require a 1.6-liter turbo at about 2 bar (29 psi) of boost, and Volvo is bravely using its own Drive-E-based street engine, the only entrant so far to do so. It is mounted transversely and as far back as the rules allow, leaving a roomy engine bay dominated by the huge intercooler. The exhaust note is sharp and crackly, unlike a

I'm honored to have been allowed on track—the car I drove is the only one extant. A lot of trust there, which I shoulder earnestly.



400 HP, FWD, AND OFF-THROTTLE ANTI-LAG. WHAT COULD GO WRONG?

WORDS Randy Pobst

TRACK DRIVE

normally mellow turbo thrum, in spite of running through dual catalytic converters.

Interrogating the soft-spoken and brainy engineers and designers (the entire team is Swedish), I learn the rules are quite strict, but they are so far pleased with the series' FIA officials. But the car is new, having yet to run a race, so let's see how that pans out; I know how prickly rules can sometimes become. The S60 is light at 2,420 pounds with driver. The body is quite true to stock form with a carbon roof but steel doors. The flares jut out sharply to emphasize the original appearance.

Polestar has allowed me to crawl all over the machine, and I see MacPherson struts on all four corners with Öhlins shocks. The lower control arms look very long to me, mounted to a fabricated tubular-steel subframe near the center underneath. Such a setup reduces roll-center migration, a downside of the strut. The upside is strength at a lower cost than more complex arrangements, and the rules require struts anyway, so it's the same for every team. This is a theme I heard repeated several times. The Polestar Volvo team seems to relish competing on a level playing field.

They allow that the rear suspension is a bit stiffer, and I see anti-roll bars on both ends in sophisticated low-drag bearings, both set in their nearly full-soft positions. The differential is a clutch-type mechanical limited-slip with ramps, à la Porsche, continuing the series' philosophy of minimal electronic controls. No traction, stability, anti-lock braking, or diff control. It's all natural, as I like to say. Driver dependent. Bravo, WTCC.

The tires are spec Yokohama race slicks, and the camber settings look mild. I remember seeing crazy rear camber in the C30s Volvo ran in the past Swedish Touring Car Championship, like something out of *Stance* magazine, and I ask if such a setting is in the plans. It's early, they chuckle, and it has not been ruled out. With the same size slicks all around and far less load in the back, FWD needs a few unexpected tricks to work.





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6-speed manual

2,425 lb (mfr) 110.2 in

193.9 x 77.0 x 54.9 in

4.9 sec (mfr est)

2.0 lb/min Never I dug, but the most I could squeeze out of the engineers was something vague about roll centers and ride height. Race engineers hold their cards close to the chest.

Enough blah-blah. Let's drive this thing. With only the firewall and no dash, the steering wheel is suspended out in space with a small electronic Pi instrument cluster. We're pretty much in the back seat, and low. Even with my long torso and neck, I can barely peep over the cowl. The rollcage is well below the roofline but still well above my helmet, which I suggest is to lower the center

Keep an eye on the Polestar Volvo. These Swedes are serious about speed.





of gravity. More smirks. Strictly regulated, too.

I grew up racing front-drives, so I know the breed. And clearly, the World Touring Cars are in their own league in torque, really pushing the limits of FWD with all that boost. This has way more torque than the high-revving non-turbo Honda and Mazda Touring Cars I've raced, and it incorporates an anti-lag system that keeps the boost up even off throttle, like the import drag cars we see on YouTube. It really just feels like a nice 3.0-liter: zero delay, linear power delivery.

The healthy torque tightens the steering, forcing me to have to unwind the wheel myself, and the car hunts and tramlines a lot on the straights. Torque steer, no wonder. With this level of oomph, the fundamental rule of high-performance FWD is even more

important: more acceleration, less steering. The gas pedal and steering wheel must be opposites, or you push madly. I had to consciously work on this because of that lack of self-centering on throttle. The Volvo also understeered strongly even on steady power yet not at all off-throttle, even in the first-gear hairpin. It is very early in the development of this new World Touring Car, and I hope to get to try it at the end of the season to see what Polestar has come up with.

Some of these characteristics were exaggerated by the cold and slightly damp track condition. I'm honored to have been allowed on track, considering the example I drove is the only one extant. A lot of trust there, which I shoulder earnestly. That explains why I was 20 mph slower than the factory guy in

Volvo Polestar recognizes that the series is primarily a show and must exhibit competitive races to succeed, so it accepts the series rules, which add "success ballast" to the cars that run the fastest laps, averaged over the past three races. This can get as heavy as 175 pounds. All entries of that model get it, not just the fast driver, and I like that, having often been frustrated with driver "welfare" weight here in the U.S.

The Volvo S60 WTCC racer is a unique beast, beautifully executed, and it greatly piques my interest in a series I knew little about until now. With its high power, it presents real challenges to both driver and engineer, front-wheel drive to the extreme.

I'll watch the season with interest. With seven races in Europe and five more outside, it truly is a world series, including even Russian and Chinese venues. Keep an eye on the Polestar blue Volvo. These Swedes are serious about speed.





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sensors already installed.









The CX-9 three-row crossover is the latest vehicle in Mazda's lineup to get a full redesign under the Kodo language, and let us be the first to say it's gorgeous. It looks lean and sexy, and like the SUV of the Yearwinning Volvo XC90, it has a long hood to help give it a tall wagon look rather than that of a bloated crossover. It's 1.2 inches shorter in length than its predecessor but rides on a wheelbase stretched by 2.2 inches, and the resulting shorter overhangs add to the impression of sportiness.

Alas, this is a family transportation device, so practical considerations are the most important. The CX-9's middle row of seats slides forward to allow ingress into the third row, which has ample space for adults even up to 6 feet tall.

There. Now back to the oily bits. The CX-9 comes exclusively with a six-speed automatic transmission. Front-wheel drive is

THREE ROWS & A BABY TURBO

Words Jason Cammisa

standard, but predictive all-wheel drive is an option. As is usual these days, Mazda's sexy styling comes second only to substance, and the contents of the CX-9's engine compartment have been thoroughly updated. The old 3.7-liter V-6 has been replaced with a turbocharged, 2.5-liter I-4 that prioritizes real-world torque over marketing-material horsepower. Even though Mazda expects the CX-9 to offer class-leading EPA fuel economy, the engine is chock-full of tricks that won't









necessarily help on those standardized tests. Mazda is far more concerned with real-world performance, and to that end it gave the new direct-injected engine an aggressive EGR (exhaust-gas recirculation) cooling system.

Most turbocharged engines will burn extra fuel to keep cool under boost. This reduces the very benefit of having a smaller-displacement engine in the first place. Mazda says the cooled EGR system reduces exhaust-gas temperatures to the point that this rich mixture isn't necessary. Also assisting in thermal management is a 4-3-1 exhaust manifold that uses the reflected exhaust pulse from one cylinder to help suck a bit more of the hot, spent exhaust out of another.

The exhaust manifold also includes a second set of valves that route gasses through smaller-diameter ports at engine speeds below 1,700 rpm. This raises the velocity of the exhaust air and helps spool the single-scroll turbo more quickly. Maximum boost is a healthy 17.4 psi—and with that blown into the high-compression-ratio (10.5:1) 2.5-liter, we'd expect a high peak horsepower number.

And yet the big four produces just 227 hp on 87-octane regular fuel or 250 hp on 93-octane. Gee, that doesn't seem like much.

Oh, but like with the fuel economy, Mazda doesn't want to concentrate on numbers in

a book. Its focus remains on the experience. The company's research shows that most drivers of large crossovers rarely if ever exceed 3,000 rpm—and that means big low-end torque would help these drivers more than screaming-engine horsepower.

Once there's no need for a high peak horsepower, there's no need for a huge turbocharger—and that means much less lag. Indeed, peak boost happens early, resulting in a healthy 310 lb-ft of torque at 2,000 rpm, which then fades from there.

Slip behind the wheel of the CX-9, and you'll immediately realize that this was the right trade-off. Off the line, the turbo responds almost instantaneously, and the engine's low-end grunt gives the CX-9 a waftability befitting larger, more powerful luxury cars. The CX-9's engine doesn't have to rev high to accelerate briskly—nobody wants to hear a screaming four-cylinder just keeping up with traffic. The six-speed automatic does its part to keep revs high enough to mask lag but then minimizes drama by keeping the engine quiet. It shifts up under full load at just 5,000 rpm unless the transmission is in Sport mode.

If there's a drawback, it's that the CX-9's torquey engine promises more muscle

than it's able to deliver when all-out passing power is needed. At very high engine speeds, boost (and output) begins to drop off, and the 2.5-liter gets a bit raucous. But if Mazda's research is to be believed, revving like that is the exception to the crossover-driver's rule.

The engine soundtrack isn't the only thing missing from the CX-9's cabin. There isn't much road or wind noise, either. Weightsaving measures in the structure (and the lighter engine) helped pull some 250 pounds out versus the last CX-9, and that gave Mazda's engineers some latitude to put back in extra sound-deadening materials. By comparison, the smaller CX-5 has just 9 pounds of sounddeadening material in the floor to the CX-9's 53 pounds. The CX-9 also has acoustic glass in the windshield and, for the first time in a Mazda, in the front side windows. The acoustic treatment reduces interior noise levels by a claimed 12 percent at highway speeds compared with the outgoing CX-9.





systems that filter everything. The steering weights up significantly with cornering loads and continues to keep the driver abreast of what the front wheels are doing as the tires approach their limits. This steering is uncommonly good, as is the excellent body control and unexpectedly high cornering grip provided by the all-season Falken Ziex CT50 tires. The brake pedal reacts with immediacy and linear, crisp engagement of the clampers.

Our short drive of the CX-9 took place right before the car was revealed at the Los Angeles Auto Show, so our test car was fully camouflaged inside and out. It's fun driving around in camo, but it's difficult to speak authoritatively about some important parts of the

driving experience: ergonomics, for instance.

Furthermore, Mazda made it clear that the tuning on the hand-built prototype wasn't complete. They could have fooled us-from start to finish, the new CX-9 drove like a finished, polished production car. Mazda has continued its blitz of affordable, mainstream vehicles that feel anything but mainstream. The CX-9 is, even in prototype form, the driver's car of the three-row crossover segment.

No surprise there. This is the company brave enough to reduce the horsepower output of its signature sports car when every other company said it couldn't be done. It was done, and the Miata is better for it. The same thing has just happened with the CX-9. \blacksquare

2016 Mazda CX-9

BASE PRICE VEHICLE LAYOUT

ENGINE

TRANSMISSION **CURB WEIGHT**

WHEELBASE LXWXH

0-60 MPH EPA CITY/HWY/COMB Fuel econ

ON SALE IN U.S.

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2.5L/227-hp*/310-lb-ft turbocharged DOHC I-4

6-speed automatic

4,150-4,350 lb (mfr)

115.4 in

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FLASHLIGHT







600 Stores Nationwide "We Are Impressed With the SUPER HIGH GLOSS FINISH **INDUSTRIAL QUALITY EQUAL TO** Quality...The Price is Incredible" **CABINETS THAT SELL FOR UP TO \$6000** Car Craft Magazine NEV **QUALITY EQUAL TO SNAP-ON** 56" YOU WON'T FIND A BIGGER G US + GENERAL US • GENERAL BETTER CABINET FOR THIS PRICE O F - 30" US - GENERALa B Œ Rolled edges on drawers Heavy-duty Gas struts on lids INDUSTRIAL for superior rigidity casters for for easy opening mobility when **STRENGTH** Strong and smooth and closing ball-bearing slides fully loaded 44", 13 DRAWER ROLLER CABINET B 56", 11 DRAWER INDUSTRIAL CABINET G 30", 5 DRAWER TOOL CART US*GENERAL III US*GENERAL CO US*GENERAL COM **Customer Rating** LOT 69387/62270 **Customer Rating Customer Rating** *** LOT 69395 LOT 69397/61427 *** 62744/68784 shown **** 67681 shown 95272 shown 2633 lb. capacity Weighs 245 lbs. 704 lb. capacity 3458 lb. capacity Weighs 441 lbs. §1100 \$180 14,200 cu. in. of storage comp at \$1029.99 comp at \$1799.99 comp at \$349.99 D 44", 8 DRAWER TOP TOOL CHEST US*GENERAL DI US*GENERAL 000 US*GENERAL I **Customer Rating** 18" SIDE CABINET 559 lb. capacity LOT 62500 LOT 62661/68991 shown **26", 16 DRAWER Customer Rating** Modular unit also works with 56° and 72° cabinets. **ROLLER CABINET** US «GENERAL» comp at \$835.61 comp at \$799.99 **Customer Rating** US*GENERAL III US×GENERAL 🚥 6 56", 8 DRAWER TOP CHEST 18", 7 DRAWER END CABINET **Customer Rating Customer Rating** LOT 61609 **** *** LOT 62580/68785 shown 1628 lb. capacity LOT 62662/61370 shown Modular unit also works with Weighs 260 lbs. **399**99 **79**99 56" and 72" cabinets 1060 lb. Capacity comp at \$539.99 comp at \$319.99 • 14,600 cu. in. of storage **POWDER-FREE NITRILE GLOVES** PITTSBURGH ... **4" MAGNETIC** PACK OF 100 **PARTS HOLDER** SIZE L0T MED 68496/61363 **Customer Rating** 68497/61360 *** 5 mil X-LG 68498/61359 LOT 62535/90566 shown thickness Customer Rating Your CHOICE *** comp at \$952.99 comp at \$14.97

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2 HP, 8 GALLON 125 PSI PORTABLE AIR COMPRESSOR **Customer Rating**

> LOT 67501 shown 68740/69667



comp at \$149

2.5 HP, 10 GALLON 125 PSI OIL LUBE **AIR COMPRESSOR**

Customer Rating * * * *



comp at \$168.99

1.5 HP, 6 GALLON 150 PSI OILLESS Professional

AIR COMPRESSOR Air delivery:
 2.5 CFM @ 90 PSI 3.4 CFM @ 40 PSI

> **Customer Rating** ***

LOT 62511/62380 68149/62894 67696 shown



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8750 PEAK/ **7000 RUNNING WATTS** 13 HP (420 CC) **GAS GENERATORS**

> LOT 68530/63086 63085/69671 shows LOT 68525/69677 CALIFORNIA ONLY

120 LED Rechargeable **UNDER HOOD WORK LIGHT**

luminar WORK

LOT 60793

Customer Rating

comp at \$129.99

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LOT 61888/68885 shown

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Customer Rating

















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Customer Rating ALERT SYSTEM Bunker Hill Security LOT 93068 sho 69590/61910/62447

comp at \$29.99

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4-1/2" ANGLE GRINDER dril master **Customer Rating** *** LOT 95578/69645 60625 shows

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SLIDING COMPOUND /EL MITER SAW WITH LASER GUIDE LOT 61776/61969/61970 69684 sho **Customer Rating**

comp at \$399

18 Volt Cordless 3/8" DRILL/DRIVER WITH KEYLESS CHUCK drillmaster

LOT 69651 62868/62873 68239 shown





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42" OFF-ROAD/ FARM JACK

LOT 60668/6530 show • 3-1/2 ton capacity

Customer Rating

comp at \$59.99

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ARRIVAL 2016 Kia Sedona SX Robin Trajano



"Room for eight, dual sliding doors, rear entertainment system, 12 cupholders. Perfect for a single, 26-year-old male."

EPA CITY/HWY/COMB FUEL ECON 18/25/21 MPG BASE PRICE S37,295 PRICE AS TESTED S42,090

Until my sister and I headed off to college, our family's main vehicle was always a van. First was a mid-'90s Toyota LiteAce, followed by a Mercedes-Benz MB100 diesel and then a 2002 Honda Odyssey after we moved from the Philippines to the U.S. Our family of five has been on countless road trips and made many memories on the road with our vans thanks to their ability to swallow people and all our gear. So I understand the appeal of minivans to families, but I couldn't picture myself actually buying and owning one. That's until Ron Kiino threw me the keys to our long-term Kia Sedona, as he saw it would be a great fit for a photographer. A minivan wouldn't be my first (third, fourth, eleventh) choice, but if I had to drive one, it would be the Kia Sedona.

We opted for the SX, one notch below the full-specced Limited model, because of its more versatile Slide-N-Stow second-row seats and gas mileage (18/25 city/highway versus 17/22 for the Limited). It goes without the dual power sunroofs and the non-removable captain's chairs, but it still comes with a host of useful features. The SX trim gives you tri-zone automatic climate control, an Infinity sound system, Kia's easy to use UVO infotainment system with navigation and a backup camera, Bluetooth connectivity, heated and cooled front seats for those hot Southern California days, and a 115-volt power inverter.

We also ticked the box for the \$3,700
Technology package that adds lane departure warning, forward collision warning, front/rear parking assist, a surround-view monitor, and adaptive cruise control. I've played around with the cruise control a bit during my commute, and it seems to work quite well. It accelerates/decelerates smoothly with traffic without the jerkiness of lesser systems I've experienced. It should be a useful tool.

All Sedonas are equipped with Kia's familiar 3.3-liter V-6 that produces 276 horsepower and 248 lb-ft of torque mated to a six-speed automatic transmission. That's good for a 7.8-second run to 60





RIDE ALONG FOR UPDATES ON OUR LONG-TERM FLEET



118 ft

ing distance, 60-0 mph

Vehicle Layout Front-engine, FWD, 8-pass, 4-door van Engine 3.3L/276-hp/248-lb-ft DOHC 24-valve V-6 **Transmission** 6-speed automatic Lateral Acceleration 0.80 g (avg) Curb Weight (F/R dist) 4,655 lb (56/44%) Energy Cons, City/Hwy 187/135 kW-hrs/100 miles

16.0 sec @ 89.3 mph

7.8 sec



mph and 16.0-second quarter mile. Not blisteringly quick, but it is a 4,655-pound minivan, after all. I've been driving it for a couple weeks already, and it never feels underpowered during my daily commute. But speed is not where this minivan shines. It handles fairly well for its size and even exhibits signs of, dare I say, sportiness. Its welldamped suspension rides smoothly and quietly, even over big bumps and massive Los Angeles potholes, without feeling like a big, floaty boat.

I expect our Sedona to see countless road trips, photo shoots, and camping trips during its time with us. Piling on miles should be a breeze.



2015 Chevrolet Corvette Stingray Christian Seabaugh



"It sure sucked having the Corvette out of action for a week at the dealer for warranty repairs." @C Seabaugh

Since the last update, I've had plenty of time to get reacquainted with my long-term 2015 Corvette Stingray Z51. Unfortunately, so has the dealer.

After living with a handful of fit and finish issues, I finally had the kick in the pants I needed to get me to the Chevy dealer: a MyLink center console display that no longer displayed images. With the Corvette set to spend time at the dealer to get the MyLink display repaired, I opted to have the creaking targa top and squealing brakes addressed, too.

The daylong repair that the dealership promised quickly turned into a weeklong affair because of a scarcity of parts and a work backlog for the dealer's Corvette



The cure for the click-clack of the targa top seems to be removing the panel and stowing the roof in the trunk. Unfortunately, doing so ruins the Corvette's great profile view.

Service life / 10 mo/17,941 mi Avg CO2 / 0.88 lb/mi

Energy cons / 152 kW-hrs/100 mi **Unresolved problems /** Squeaky targa top Maintenance cost / \$0 (2-oil change, inspection, tire rotation)

Normal-wear cost / \$1,621 (Michelin Pilot

Super Sports)

Base price / \$55,995 As tested / \$64,880

REAL MPG FUEL ECON 22.1 MPG comb.

With MyLink malfunctioning, all radio and navigation



techs. The fix for the MyLink display consisted of taking the dashboard apart and completely replacing the MyLink display in the center stack and the driver info display on the instrument cluster. The dealer cured the Corvette's squealing brakes by cleaning off excessive dust and lubing them. As for the click-clack of the targa top? Well, it still does that. The dealer described the sound as "normal body flex noise" despite the fact that the Corvette spent the first half of its life rattle-free. Although I certainly won't be giving up on a fix for the rattling targa top, at this point I'm just happy to be able to turn the music up, put the hammer down, and enjoy listening to the Corvette's LT1 sing for a bit.

LONG-TERM TEST | Updates







2015 Honda CR-V Touring AWD Zach Gale



"On the next-gen CR-V, I'd rather have Honda focus on delivering even more mpgs and a longer driving range instead of greater quickness." @zachgale

I hate to break it to you, but CR-V does not stand for Constantly Racing Vehicle. Although the longterm 2015 Honda CR-V is no sports car, it continues to perform well after our months behind the wheel.

Even with the high-end Touring model's 18-inch wheels, its ride never feels overly harsh, and body roll is kept in check. The CR-V doesn't feel as small as a Fit or as big as a Pilot, but it always performs competently. Sure, I'd enjoy the CR-V more if it were quicker, but our long-termer's 8.9-second 0-60 time is in line with other high-volume AWD competitors

Service life / 7 mo/10,239 mi Avg CO2 / 0.77 lb/mi Energy cons / 134 kW-hrs/100 mi

Unresolved problems / None Maintenance cost / \$77.47 (oil change, inspection tire rotation)

Normal-wear cost / \$0

Base price / \$33,775 As tested / \$33,775



REAL MPG FUEL ECON 25.2 MPG comb.

we've tested, including a 2013 Toyota RAV4 at 8.7 seconds and a 2014 Nissan Roque at 9.1 seconds. Even considering how slow our CR-V becomes in Econ mode—0-60 takes a Motor Trend-tested 9.7 seconds—I'd rather have Honda continue to improve efficiency. As long as the fuel tank is of a decent size, a more efficient daily driver visits the gas station less frequently and doesn't cost quite as much to operate.

A small number of CR-V owners have reported experiencing a vibration through the driver's seat. I've only experienced it at idle, and it's subtle and intermittent. Product improvements weren't ready at our first service, but they became available in November 2015. We'll get the CR-V updated at our next service and hope to test how fuel economy might be affected; the 2016 CR-V's EPA city/highway numbers dropped 3-6 percent depending on the model. Honda notes that the vibration has no effect on reliability, and although this moves efficiency in the wrong direction, even with the 2016 CR-V's slight decline in EPA-rated mpgs, it's still near the top of its segment.

I'm happy with how the CR-V actually drives overall, but like most vehicles in this class, it could be a little quicker or more efficient. Still, despite the CR-V only offering active safety tech on the top trim level, it presents a compelling argument for Accord buyers who are willing to sacrifice a tad in acceleration and efficiency for a versatile and spacious crossover.





2015 Chevrolet Tahoe LT Frank Markus



"I'm always surprised by how often this beast manages to slip into its fuel-sipping V-4 mode, even at slightly super-legal interstate speeds." @MT_Markus

When Motor Trend HQ asked the Detroit office to send our hardworking, 2015 TOTY-winning longterm Chevrolet Colorado out west, we demanded a replacement capable of towing our 3,400-pound tailgate-party trailer. "How about the Tahoe?" Sold! Only after it arrived did we realize that unlike the vast majority of Tahoes sold up here in the rust belt, this one's 5.3-liter V-8 only spins its rear wheels.

So for Halloween, we dressed our Californiaplated rear-wheeler up as a native Michigander with a set of four Bridgestone Blizzak DM-V2 winter Service life / 11 mo/32,910 mi Avg CO2 / 1.05 lb/mi

Energy cons / 183 kW-hrs/100 mi Unresolved problems / None

Maintenance cost / \$71.95 (4-oil change, inspection; 3-tire rotation)

Normal-wear cost / \$0 Base price / \$51,950 As tested / \$55,880

REAL MPG FUEL ECON 18.4 MPG comb.

tires (\$745.20 at Tirerack.com). They already proved invaluable during a mid-November snowstorm, affording stopping and cornering power that seemed little diminished from that of the Goodvear Assurance CS all-season tires in the wet. Yes, too much throttle overworks the traction-control system, but the bottom line is that this arrangement feels way more secure than the rear-drive-andsnow-tires setup my dad always seemed to make



There's no knob to change that 2WD reading to anything else or to light up the front differential, but you can measure the slope you're scaling or crossing and see the front wheel steering angle. This peculiar "feature" arrived with the recent OnStar update that cured our Navi troubles.

work on a series of 1960s Chevys. The downside? On smooth concrete they sing like off-road tires, and as with most winter tires, they feel greasy when cornering or stopping hard on dry, warm pavement.

Just before the Tahoe made the trip east. a moving van grazed the left front fender and fascia while the SUV was parked. Replacing and painting those two parts cost \$2,471.15. The dealer performed the 30,000-mile service at the same time (oil, filter, inspections, and a tire rotation we waived due to the new snows) for \$71.95. We only have a few more months to enjoy the Tahoe's plussize comfort, during which the fuel economy may dip as we enter the season of 15-minute remotestart warm-ups for 10-minute commutes to the office. Hey, don't yell at us. We're just now spewing the tailpipe CO2 we saved when pre-warming our plugged-in long-term Volt.





2016 Nissan Maxima SR Jason Udy



Lots of other drivers take notice of the 2016 @Nissan Maxima's swooping body shape as I pass them. @MT JasonUdv

The Maxima SR sedan offers a comfortable seating position and good interior ergonomics, but it has some visibility issues. When making a right turn, the rake and thickness of the A-pillar combined with the placement of the side-view mirror creates a huge blind spot when checking ahead and to the left for pedestrians.

During a routine visit for an oil change, the dealer said our car had an outstanding recall related to the fuel tank. A crash could cause the fuel tank to leak, increasing the risk of a fire. Once all the

Service life / 3 mo/7.711 mi Avg CO2 / 0.80 lb/mi Energy cons / 139 kW-hrs/100 mi Unresolved problems / None Maintenance cost / \$70.71 (oil change, inspection tire rotation) Normal-wear cost / \$0 Base price / \$38,495 As tested / \$38,750

VERAGE MPG FUEL ECON 24.3 MPG comb.

required parts arrived, I returned to the dealer to have the fuel tank and some supporting parts installed. A few days after I picked up the Maxima, the check engine light illuminated. My suspicion that the issue was related to the fuel tank replacement was confirmed when it was discovered that the culprit was an EVAP system vent tube that hadn't been tightened down correctly—a quick and simple fix.





2015 Mercedes-Benz CLA250 4Matic Chris Clonts



Watching the dance of intake and pickup at the high-volume **Beverly Hills Mercedes** service department is like watching planes at LAX.' @CClonts

At 10,000 miles, the baby Benz was due for its first service appointment. It's the usual oil/filter change, inspection, etc. Total cost: \$181.18. That's not ultra pricey considering the luxury class and the area, and I got a fabulous dealer experience.

I'd always wondered about how noisy it is at cold start-up. There's a clatter under the hood I don't hear during warm starts. The service adviser told me this is normal then recommended an alignment and new front tires after pointing out accelerated wear at the edge of each tire, as if "someone"

Service life / 6 mo/10,920 mi Avg CO2 / 0.74 lb/mi

Energy cons / 129 kW-hrs/100 mi Unresolved problems / None

Maintenance cost / \$181.18 (oil change, inspection)

Normal-wear cost / \$0

Base price / \$34,425 As tested / \$46,140

REAL MPG FUEL ECON 26.1 MPG comb.

has been taking corners, uh, briskly.

Now we come to the mystery portion of the report. The paper-and-pen fuel log indicated just under 22 mpg overall. That's significantly below the EPA estimate of 27 mpg combined and our Real MPG test number of 26.1 mpg. I doubt anybody buying a CLA makes the call on mileage, but we might have the Real MPG guys test it one more time just out of curiosity.





2015 BMW M3 Edward Loh



"Drive around in a snot-yellow M3 and rou get a lot of questions. All who asked were shocked to find that I liked but did not love the car." @EdLoh

In just under a year, we logged 27,596 miles on our Austin Yellow 2015 BMW M3. That's an impressive number of miles under my watch, since I live only 3 miles from the office, but I had a lot of help. I loaned the vehicle to various staff members when I was out of the office traveling. Jason Udy made several road trips to Salt Lake City, Utah, and found winter driving an M3 over the San Gabriel and Wasatch mountain ranges to be a cool breeze—so long as common sense and Pirelli Sottozero Serie II winter tires were utilized.

For local trips, I most often handed the keys to trusted online producer Carol Ngo for her 60-mile round-trip commute from L.A. to Orange County. Her take on living with the M3 echoed my own general sentiments and those of other staffers: "The color took some getting used to, but over

Service life / 12 mo/27,596 mi Base price / \$62,925

Options / Carbon-ceramic brake rotors (\$8,150), 7-speed twin-clutch auto (\$2,900), Lighting package (\$1,900: adaptive LED headlights, auto high-beam control), 19-inch black wheels (\$1,200), Austin Yellow Metallic paint (\$550), enhanced Bluetooth and smartphone connectivity (\$500)

Price as tested / \$78,125

Avg fuel econ/C02 / 20.3 mpg / 0.96 lb/mi **Problem areas /** Brake judder, door seals Maintenance cost / \$0 (2-oil change, inspection; 1-cabin air filter)

Normal-wear cost / \$0 3-year residual value* / \$41,406 Recalls / Engine compartment sound insulation

EPA MPG CITY/HWY/COMB FUEL ECON 17/24/19 MPG

*Automotive Lease Guide data



time, I learned to love it; it definitely stands out from the rest. Aside from the brakes and squeaks, I loved driving it on empty highways, ripping along in Sport+ mode. It sounds pretty damn beefy. All my friends loved it, too; they just enjoyed being driven around because the back seat is pretty roomy. I fit my whole bike in there without having to remove my front wheel."

We had no service issues with the M3—just two regular oil changes, both free of charge, covered under BMW's four-year, 50,000-mile warranty. A creaking chassis and shrieking brakes were early and constant complaints we tried to address at our oil change appointments and via correspondence with BMW's headquarters. The chassis noises turned out to be a result of dirty door seals and were eventually addressed through cleaning and silicone lube. The brake issues only went away if we went to the track: more on that later.











Over time, I got used to the M3's peculiarities and intoxicating performance. My initial seething frustration with the dual-clutch transmission's parking sequence faded to mere chagrin every time I failed to follow the correct shutdown sequence. I stopped driving it like a madman after our week of testing during Best Driver's Car 2014; turns out you have little to prove after blasting up and down a 4-mile ribbon of road Motor Trend has shut down with the help of the CHP.

Along the way, I learned that the M3 will indeed surf: I dropped the rear seats to squeeze in a 7-foot surfboard on numerous occasions and even used a neat suction cup rack provided by our friends at Sea Sucker to carry a 10-foot longboard to my local break. At the end of our time with the M3, we sent it off in a manner befitting an Ultimate Driving Machine. For the pilot episode of his new YouTube program, "The Racing Line," our resident track assassin Randy Pobst needed a fast five-seater to demonstrate oversteer to a "studio audience." Filming took place at the gorgeous Atlanta Motorsports Park in Georgia, more than halfway to BMW's headquarters in New Jersey, so we said our goodbyes and strapped the M3 to a trailer headed east. After his shoot concluded, Randy kindly sent these notes:

"The M3 was an excellent candidate for the pilot episode on oversteer, as its minimal turbo

lag and strong midrange torque could create long-lasting slides for the cameras, even with four actors onboard with me! Believe me, the squeals of delight caught on film are genuine. In fact, the tail was more than ready to slide out at most times. Also impressive was the wear of the Michelin Pilot Super Sport tires, even under duress. The spares we brought were not necessary. Camera-car drive-bys were also facilitated by the strong and fade-free brakes. The standard non-adjustable suspension was a tad soft for extreme track work but pays back in street comfort."

Randy's comments highlight a key point: The M carbon-ceramic brakes work really well as intended: at the track, under conditions that generate intense, sustained heat. On trips to the office or our favorite third-wave coffee shop, the stopping power stayed true, but came with gritty pedal feel and a nails-onchalkboard soundtrack. It got old, quick. So here are things I would do differently if I could order the M3 again, I'd skip the \$8,150 M carbon-ceramic brake package and instead spend \$4,900 on the Executive package for the smartkey, park distance control, and rearview camera. (If you're considering a new M3 in 2016, hold your horses, because the rearview camera might come standard ahead of the 2018 mandate.) With the leftover cash, I'd put \$1,000 toward the M adaptive dampers and save the rest for speeding tickets.

"Minimal turbo lag and strong midrange torque create long-lasting slides."

2015 BMW M3 POWERTRAIN/CHASSIS DRIVETRAIN LAYOUT Front-engine, RWD **ENGINE TYPE** Twin-turbo I-6, aluminum block/ DOHC, 4 valves/cyl VALVETRAIN 181.8 cu in/2,979cc DISPLACEMENT **COMPRESSION RATIO** 10.2:1 **POWER (SAE NET)** 425 hp @ 5,500 rpm TORQUE (SAE NET) 406 lb-ft @ 1,850 rpm 7,500 rpm REDLINE WEIGHT TO POWER 8.4 lb/hp TRANSMISSION 7-speed twin-clutch auto **AXLE/FINAL-DRIVE RATIO** 3.46:1/2.32:1 Struts, coil springs, anti-roll bar; multilink, coil springs, anti-roll bar SUSPENSION, FRONT; STEERING RATIO 15.0:1 **TURNS LOCK-TO-LOCK** 2.8 15.8-in vented, drilled, carbonceramic disc; 15.0-in vented, BRAKES, F; R drilled, carbon-ceramic disc, ABS 9.0 x 19-in; 10.0 x 19-in, forged aluminum WHEELS, F; R TIRES, F; R 255/35R19 92Y; 275/35R19 100Y Michelin Pilot Super Sport DIMENSIONS WHEELBASE 110 7 in 62.2/63.1 in TRACK, F/R **LENGTH X WIDTH X HEIGHT** 184.5 x 73.9 x 56.1 in **TURNING CIRCLE** 40 0 ft **CURB WEIGHT** 3,571 lb WEIGHT DIST. F/R 52/48% **SEATING CAPACITY** 5 HEADROOM, F/R 40.3/37.7 in LEGROOM, F/R 42.0/35.1 in 55.1/55.1 in SHOULDER ROOM, F/R **CARGO VOLUME** 12.0 cu ft TEST DATA **ACCELERATION TO MPH** 1.6 sec 2.4 0-40 0-50 3.0 3.9 0-60 49 0-70 0-80 6.1 7.4 90 0-100 0-110 10.7 12.8 0-120 18 PASSING, 45-65 MPH 12.2 sec @ 117.3 mph **QUARTER MILE** 99 ft **BRAKING. 60-0 MPH** 0.99 g (avg) LATERAL ACCELERATION 24.0 sec @ 0.85 g (avg) MT FIGURE EIGHT TOP-GEAR REVS @ 60 MPH 1,800 rpm

CONSUMER INFO	
STABILITY/TRACTION CONTROL	Yes/yes
AIRBAGS	Dual front, front side, f/r curtain, front knee
BASIC WARRANTY	4 yrs/50,000 miles
POWERTRAIN WARRANTY	4 yrs/50,000 miles
ROADSIDE ASSISTANCE	4 yrs/unlimited miles
FUEL CAPACITY	15.8 gal
EPA CITY/HWY/COMB ECON	17/24/19 mpg
ENERGY CONS, CITY/HWY	198/140 kW-hrs/100 miles
CO2 EMISSIONS, COMB	0.99 lb/mile
RECOMMENDED FUEL	Unleaded premium



3

"Another preferred customer attribute of the Accord Hybrid: subtlety at being a hybrid. That's probably my favorite thing about the car."

A couple months before the Honda Accord Hybrid was set to return to its maker, I visited Honda headquarters. You see, while I had been driving a Modern Steel Metallic car, so had thousands of genuine customers. I wanted to find out who those consumers were. What their purchase considerations were. How closely I could identify with them.

Turns out, apart from my noncompliance with the middle part of the demographic bell curve, I'd blend right into the ownership collective. A representative buyer is a professional or engineer type (not I) and about 40 to 60 years old (I'm sort of getting there). Seventy percent of the customer base originates

Service life / 13 mo/43,071 mi Base price / \$35,695 Options / None Price as tested / \$35,695

Avg fuel econ/CO2 / 42.3 mpg / 0.46 lb/mi

Problem areas / None

Maintenance cost / \$379.42 (3-oil change, inspection; 2-tire rotation; 1-cabin air filter, engine air filter)

Normal-wear cost / \$0
3-year residual value* / \$18,204
Recalls / None

REAL MPG CITY/HWY/COMB FUEL ECON 46.8/41.6/44.3 MPG

*Automotive Lease Guide data



from the boomer and Gen X ranks. I don't fit that mold. But my experience over 40,000-plus worry-free miles appears to largely mirror theirs.

One big factor that drove shoppers to Honda's hybrid was the "superior driving dynamics." To recap, Honda began with the innocuous Accord sedan and then transformed it. Building on a unibody structure that returned a 2014 IIHS Top Safety Pick+ score (with the "+" attributed to audible and visual forward collision warnings) the Hybrid model gained a fully aluminum front subframe and amplitude-reactive shock absorbers. A hybrid powertrain and by-wire brake system take up residence underneath the hood. An air-cooled lithium-ion battery sets up shop in the trunk.

The product turned out better than we could have hoped. To Honda, the Accord Hybrid signified the first gas-electric salvo in its post-Integrated Motor Assist era; it shows that Honda's world-class engineering brain trust can do more than sandwich an electric motor between crankshaft and transmission. The car demonstrates the real industry progress achieved. Our 2007 Toyota Camry Hybrid long-termer averaged 33.5 mpg; a 2010 Ford Fusion Hybrid (employing essentially the same hybrid technology) sipped its way to 35.5; the very different Accord Hybrid settled on 42.3.

Low maintenance costs worked in Honda's







favor, as well. I expensed \$379.42 for three service stops over 43,000 miles, and this car's self-governing Maintenance Minder system (there are no predefined service time/mileage intervals) reckoned we could travel around 11,298 miles between oil changes. The 2007 Camry Hybrid was serviced five times in 25,000 miles for \$392.71, the 2010 Fusion Hybrid cost \$218 over 23,475 miles, and our long-term gas-only 2013 Accord Sport demanded two dealer visits through 22,856 miles at \$209.42.

Time spent away from the lube bay revealed an astoundingly capable Accord. Steering and handling is on the livelier end of the midsize sedan range. The brake feel and response are among the best of any vehicle shouldering both energy recuperation and friction management duties. Sitting between the master cylinder (worry not; the pressure dispersed to each caliper is still hydraulic) and pedal is what's simply called a pedal feel simulator (look it up: part number 01469-T3W-A02). The pedal feels stiffer than normal at first, but after getting used to it, you realize the typical hybrid grabbiness isn't there.

The two-motor hybrid system not only rations fuel but also exploits each drop as much as possible. Consider the Accord Hybrid moves from 0 to 60 mph in 7 seconds flat, which is 0.6 second faster than five current-generation Accord I-4/CVT sedans we've tested. The hybrid model also weighs 231 pounds more and puts less power to the wheels (but greater torque). The powertrain consists of a 2.0-liter Atkinson-cycle four-cylinder and the two e-motors (only one is tasked with propulsion) that help constitute the electrically assisted CVT, endowed with a system rating of 196 horsepower. The number isn't what drives the car, though, because the 196 hp supplied by

the engine and battery is what's necessary for the torquey e-motor to sustain its 166-hp peak output. That's 166 hp physically moving the car. Heavier and less powerful yet quicker, more responsive in real-world driving, and less thirsty for 87-octane. If these benefits aren't considered in your hybrid premium payback calculations, I suggest cutting to the chase and going straight for the third-gen Prius

Our Real MPG program exposed the true miles per gallon we could expect: 46.8/41.6/44.3 mpg city/highway/combined. Not quite the EPA's 50/45/47 mpg, but still pretty decent. The lifetime 42.3-mpg outcome reflects the highway's influence—I didn't get to 43,071 miles in 13 months without a lot of open road and some staff assistance. I frequently saw more than 50 mpg on traffic-filled days of driving. (The Accord Hybrid loves traffic.)

on clearance racks.

The most distinct quirk was a sporadic e-motor noise that snuck up past the 30,000-mile mark, an inoffensive-to-my-ears whine that came and went. I also found the infotainment and navigation system interface's look and feel unbecoming of a car of this tech caliber. Issues aside, I believe owners would summarize the Accord Hybrid thusly: "It is a well-executed family sedan that has a less edgy and more comfortable ride than other Accords. The interior is airy and rather spacious in the front and back. The hybrid system is great. Quiet, though the engine can drone on the highway or when going uphill. Wish the back seat folded down and the trunk had more space."

I had brought up the fixed seat and battery-impacted trunk dilemma in the meeting with Honda. Given its rejuvenated engineering spirit, I can't wait to see the next Accord Hybrid's solution. ■



2014 Honda Accord Hybrid Touring POWERTRAIN/CHASSIS

DRIVETRAIN LAYOUT	Front-engine, FWD
ENGINE TYPE	Atkinson-cycle I-4, aluminum block/head
VALVETRAIN	DOHC, 4 valves/cyl
DISPLACEMENT	121.6 cu in/1,993cc
COMPRESSION RATIO	13.0:1
BATTERY TYPE	1.3-kW-hr lithium-ion
POWER (SAE NET)	141 (gas)/166 (elec)/196 (comb) hp
TORQUE (SAE NET)	122 (gas)/226 (elec) lb-ft
REDLINE	Not indicated
WEIGHT TO POWER	21.5 lb/hp
TRANSMISSION	Cont. variable auto
AXLE/FINAL-DRIVE RATIO	3.42:1/2.71:1 (Engine Drive, est)
SUSPENSION, FRONT; REAR	Struts, coil springs, anti-roll bar; multilink, coil springs, anti-roll bar
STEERING RATIO	13.4:1
TURNS LOCK-TO-LOCK	2.6
BRAKES, F; R	11.5-in vented disc; 11.1-in disc, ABS
WHEELS	7.5 x 17-in, cast aluminum
TIRES	225/50R17 94V M+S Michelin Energy Saver A/S
DIMENOIONO	

	. 37
DIMENSIONS	
WHEELBASE	109.3 in
TRACK, F/R	62.4/62.7 in
LENGTH X WIDTH X HEIGHT	192.2 x 72.8 x 57.5 in
TURNING CIRCLE	38.1 ft
CURB WEIGHT	3,569 lb
WEIGHT DIST, F/R	60/40%
SEATING CAPACITY	5
HEADROOM, F/R	37.6/37.0 in
LEGROOM, F/R	42.5/38.5 in
SHOULDER ROOM, F/R	58.6/56.5 in
CARGO VOLUME	12.3 cu ft

TEST DATA	
ACCELERATION TO MPH	
0-30	2.7 sec
0-40	3.8
0-50	5.2
0-60	7.0
0-70	9.5
0-80	12.8
0-90	18.0
PASSING, 45-65 MPH	3.8
QUARTER MILE	15.7 sec @ 85.9 mph
BRAKING, 60-0 MPH	117 ft
LATERAL ACCELERATION	0.80 g (avg)
MT FIGURE EIGHT	28.0 sec @ 0.61 g (avg)
TOP-GEAR REVS @ 60 MPH	2,200 rpm (Engine Drive)
CONSUMER INFO	

CONSUMER INFO	
STABILITY/TRACTION CONTROL	Yes/yes
AIRBAGS	Dual front, front side, f/r curtain
BASIC WARRANTY	3 yrs/36,000 miles
POWERTRAIN WARRANTY	5 yrs/60,000 miles
ROADSIDE ASSISTANCE	3 yrs/36,000 miles
FUEL CAPACITY	15.8 gal
EPA CITY/HWY/COMB ECON	50/45/47 mpg
ENERGY CONS, CITY/HWY	67/75 kW-hrs/100 miles
CO2 EMISSIONS, COMB	0.41 lb/mile
REAL MPG, CITY/HWY/COMB	46.8/41.6/44.3 mpg
RECOMMENDED FUEL	Unleaded regular







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- Andrew C. (Rockville Centre, NY)



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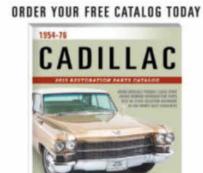
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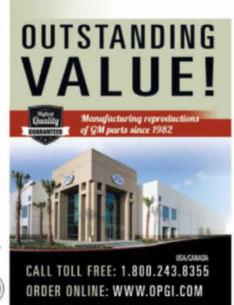
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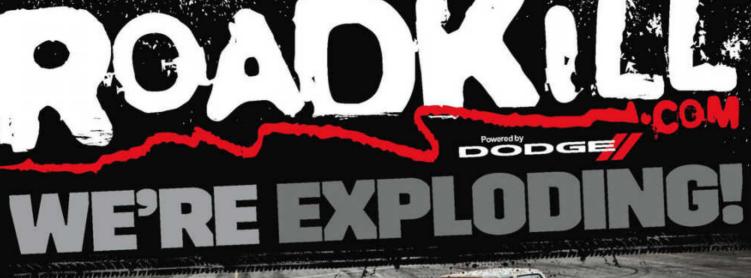


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The Big Picture



WHEN WORLDS COLLIDE TWO CARS, ONE GOAL

Cars are a product of their environment. Just park Dodge's Viper ACR alongside the Caterham 620 R. Both are barely street-legal track rats, road cars built to hot lap a winding road course as fast as possible. Yet neither could be more different from the other. Form follows function? Yes. But in the case of these two, context is everything.

With its massive 8.4-liter V-10, huge gumball tires, and a wing that looks like it was stolen from a small plane, the Viper ACR is the all-American supercar from central casting, a swaggering hulk of a thing that roars like a hungry grizzly bear and moves like Julio Jones. It's clearly born and bred in a country with cheap gas and wide-open spaces.

Perfectly proportioned for pinballing down narrow, hedge-lined English country lanes, the Caterham is a tiny, elemental machine, with no doors and simple body panels fastened directly to its tubular steel frame. Its wheels are smaller than the Viper's brake rotors, and to get in you detach a leather-clad Momo steering wheel that's barely a hand-span wide, step over the body side, and snake-hip wriggle your legs under the dash while simultaneously dropping your butt into a seat that's little more than a couple of cushions on a carbon-fiber shell. Lewis Hamilton makes it look easy.

The Caterham appears little changed from the Lotus 7 sports car Colin Chapman launched in 1957. The 7 stayed in production until 1972, when Chapman, eager to move Lotus away from its kit-car roots, sold the rights to the design to Caterham Cars. Caterham has been building its

version of the car ever since, and while it subsequently launched a model with a 4-inch wider cockpit, the 620 R's frame is the same as that of the Series Three Lotus 7. It's not the same car, though, for like Grandpa's ax—the one that's had three new heads and a new handle—there's not a single part that's shared with the original.

620 R has a supercharged, 2.0-liter Ford Duratec four that delivers 310 hp at a screaming 7,700 rpm and 219 lb-ft of torque at 7,350 rpm under its louvered hood. Impressive, but hardly a match for the Viper ACR's thumping 645 hp and 600 lb-ft, right? Before you order up a celebratory

beer and start humming "The Star-Spangled

Top dog in the Caterham Seven range, the

Banner," there's one other Caterham number you need to know: 1,201. That's how much, in pounds, the 620 R weighs. Simplify then add lightness was Colin Chapman's motto. His spirit lives on in the Caterham 620 R, which has a weight-to-power ratio of just 3.9 lb/hp, beating that of a Bugatti Veyron and a McLaren F1. And the Viper ACR's 5.2 lb/hp.

Helped by a six-speed sequential shift transmission—simply tug the stubby little shifter rearwards to upshift, and you don't even have to use the clutch at speed—the featherweight 620 R rips through the gears like a sport bike, nailing 60 mph, says Caterham, in an astonishing 2.8 seconds. By contrast, the Viper's conventional six-speed doesn't like to be hurried too much, especially on the two-three shift. The heavier ACR is about a half-second slower to 60 than the Caterham, but once those 645 horses reach full gallop ...

On paper this unlikely matchup actually looks remarkably close. But could the little Caterham really take it to the mighty Viper in a drag race? Well, you can find out for yourself by tuning into the premiere episode of our newest video series, "Head2Head Drag Race," on our new subscription video channel, Motor Trend OnDemand.

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This unlikely matchup looks remarkably close.
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